CIVIL ENGINEERING

THE MAGAZINE OF ENGINEERED CONSTRUCTION • SEPTEMBER 1961

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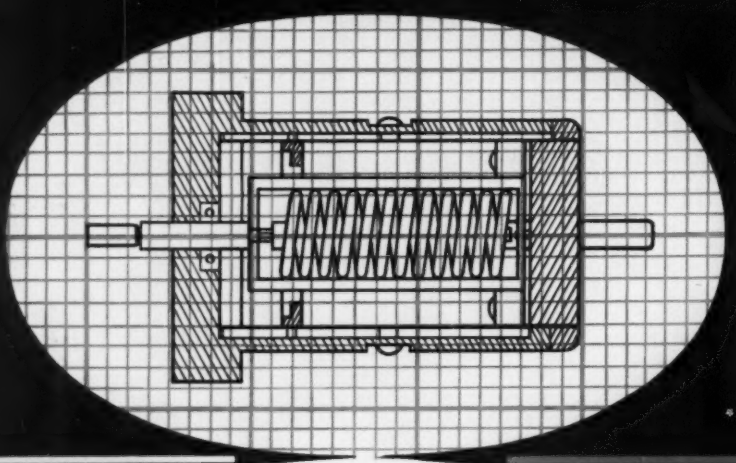

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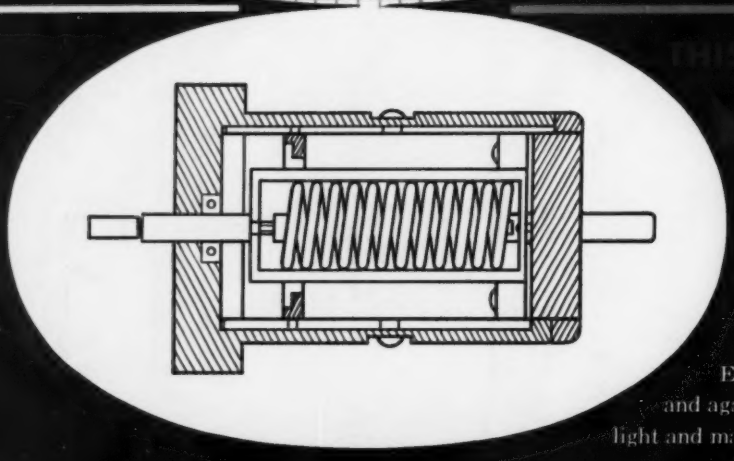

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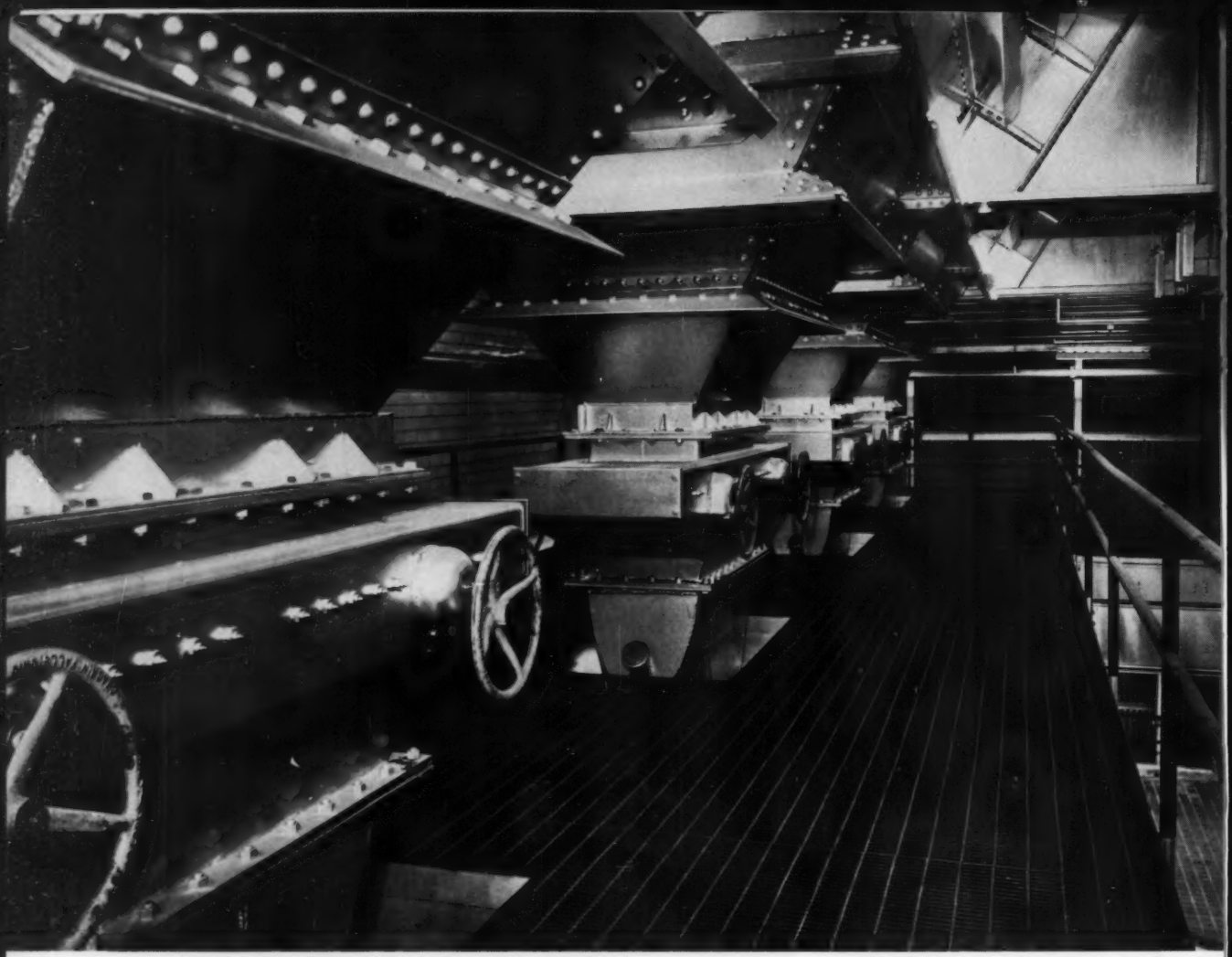

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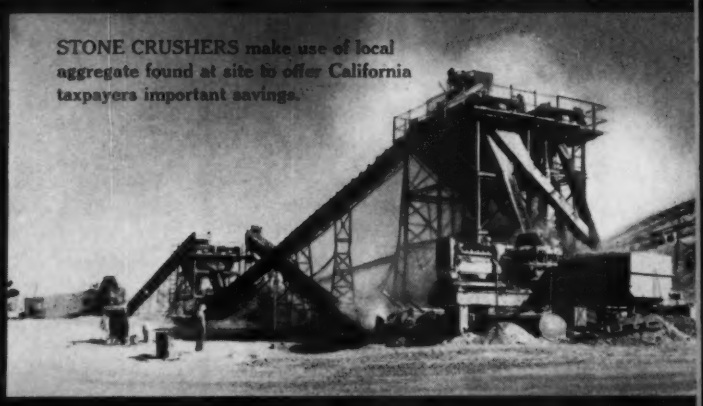
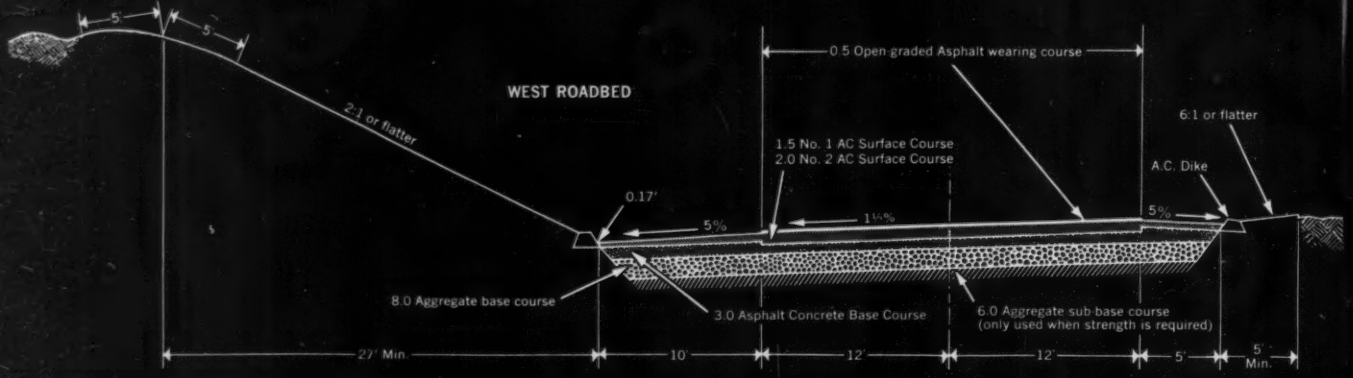
FINISHED ROADWAY on California Interstate Highway 15. Asphalt dikes and embankment on right show unusual drainage design to combat flash floods in Baker Sink region of high Mojave Desert plateau.

ASPHALT DIKES on shoulder edges direct surface water to drainage outlets.



STONE CRUSHERS make use of local aggregate found at site to offer California taxpayers important savings.



CALIFORNIA HIGHWAY ENGINEERS SPECIFY DEEP STRENGTH ASPHALT CONSTRUCTION

Asphalt dikes and ditches to divert Mojave Desert flash flood water from Interstate Highway 15.

California's largest asphalt pavement highway contract used local aggregate crushed on site resulting in substantial economies.

For the 25.2-mile four-lane, divided limited access section of California Interstate Highway 15 that replaces U.S. Route 91 from 1 mile east of Baker, California, to 1 mile east of the Cima Road, engineers of the California Division of Highways chose the Advanced Design Criteria for modern DEEP STRENGTH Asphalt Construction.

Natural Obstacles . . . Location in southeastern California on the high eastern Mojave Desert plateau, with elevations from 1,000 to 4,000 feet, posed some unusual design problems. Temperatures range from 115° in summer to 25° in winter, rainfall averages only 4¾ inches annually (which usually occurs as hard downpours).

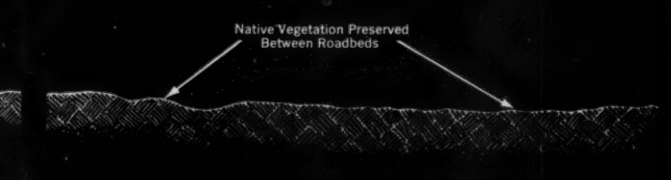
Flash floods occur because rainwater reacts with minerals in the dry sand to form an impervious crust. The resulting rapid surface run-off must be controlled to prevent undermining of the roadway. California Division of Highways through many years of study has developed an effective solution to these unique drainage problems by use of diversion ditches and dikes.

DEEP STRENGTH Design . . . The cross section below shows how California engineers made use of the principles of DEEP STRENGTH Asphalt Construction. Note 4" surface and wearing courses with 3" asphalt-concrete base course. The 8" aggregate base and 6" subbase (where necessary) consist of *water-bound* layers of 1½" max. stone compacted with pneumatic rollers and steel tandem rollers. The 8" aggregate base is primed with 0.25 gal. per sq. yard of SC-2 before asphalt-concrete base course was spread. Total thickness is 15 inches to 21 inches depending on the subsoil.

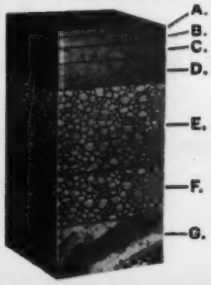
A median 90 ft. wide was used, with no treatment. (The crust and scant vegetation on median surface was kept intact to minimize erosion during periods of high surface run-off and/or wind.) Outside shoulders are 10 ft. wide and paved. Inside shoulders have 2 ft. paved and 3 ft. unpaved. (In cut sections, 5 ft. wide, all paved.)

Taxpayer Saving . . . DEEP STRENGTH Asphalt Construction allowed California's engineers to use local aggregate crushed at the site. This, plus the inherent economy of Asphalt Construction, results in important savings for the taxpayer of California. And low future maintenance costs on DEEP STRENGTH Asphalt will provide additional tax savings.

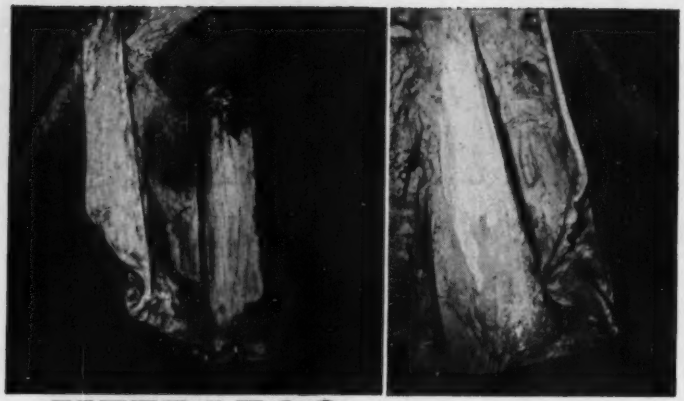
THE ASPHALT INSTITUTE College Park, Maryland



THIS IS DEEP STRENGTH DESIGN ON CALIFORNIA INTERSTATE 15



A. Wearing Course	0.5
B. No. 2 AC Surface Course	1.5
C. No. 1 AC Surface Course	2.0
D. Asphalt Concrete Base Course	3.0
E. Aggregate Base Course	8.0
F. Aggregate Subbase	6.0
G. Subgrade or Improved Subgrade	—
TOTAL MAXIMUM THICKNESS	21.0

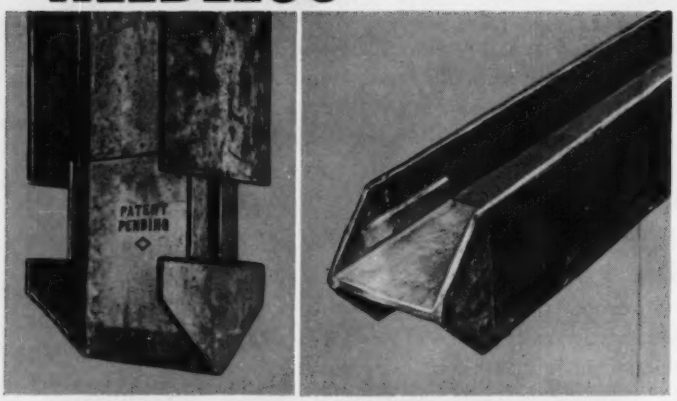


When an H-pile crumples

(as these have) in high refusal subsoil it drives harder and harder, slower and slower.

And can you, then, be certain, *sure*, that it will not fail under the design load?

NEEDLESS



But crumpling is a needless hazard, today.

With Pruyn Cast Steel Points* you can easily overcome it. Just slip Point on pile and weld . . . then drive!

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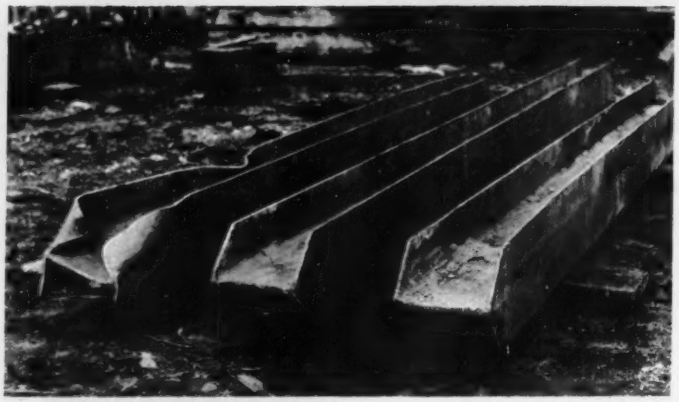
Here's visual proof . . . one unprotected and two Pruyn Pointed H-piles driven side-by-side through soil having a refusal of one inch to twenty Vulcan #1 blows. Users report full bearing value is developed and extra driving speed more than repays cost.



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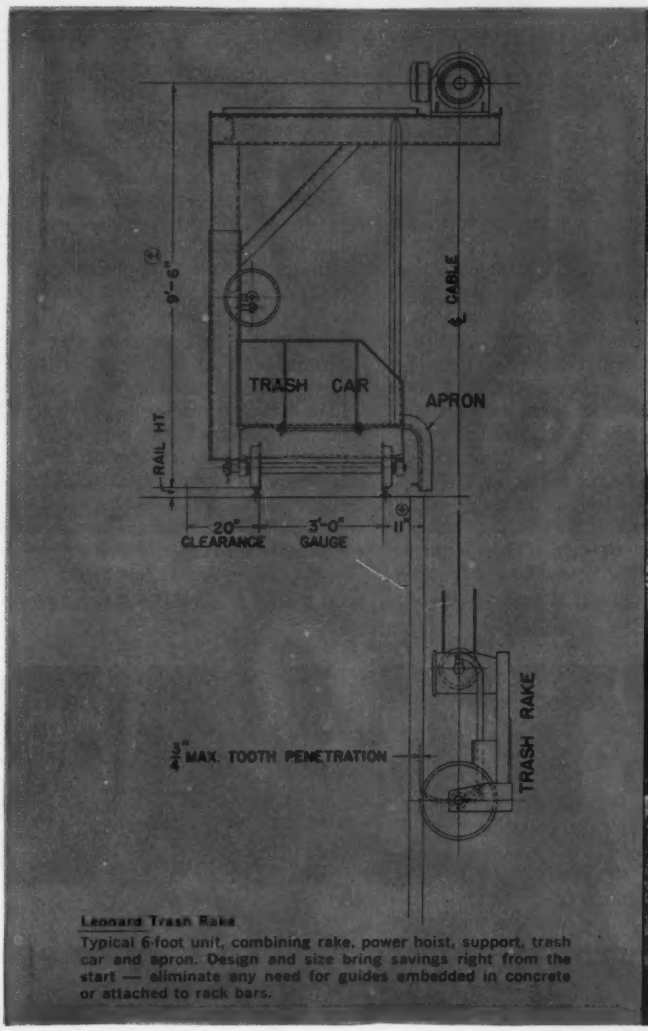
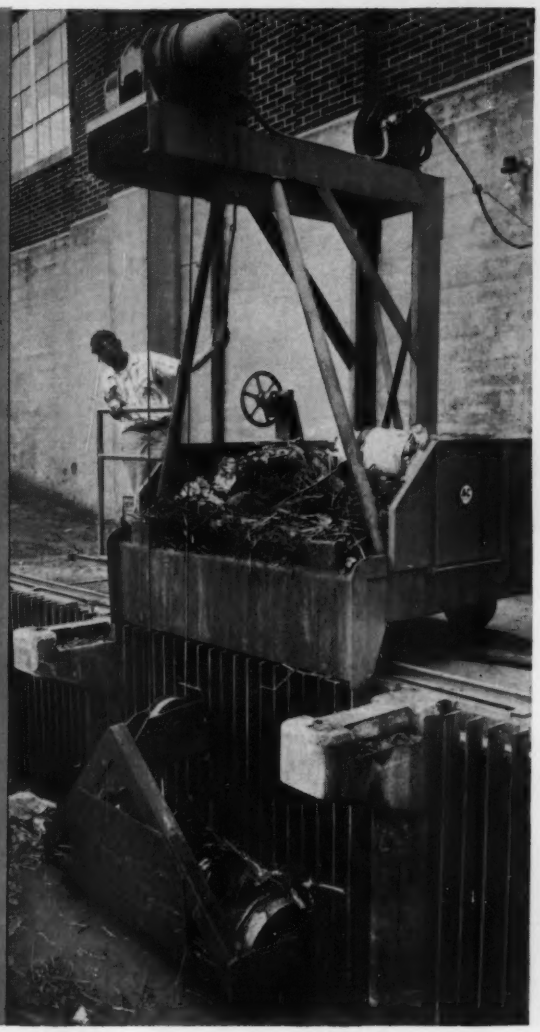


Leonard Trash Rake
Typical 6-foot unit, combining rake, power hoist, support, trash car and apron. Design and size bring savings right from the start — eliminate any need for guides embedded in concrete or attached to rack bars.



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A-1307

CONCRETE PERFORMANCE REPORT:

Monolithically-cast POZZOLITH concrete lift slabs speed construction of new "twin" apartment buildings

LIFT SLAB

Huron Towers, new twin apartment buildings in Ann Arbor, Michigan, represents the largest scale use of the Youtz-Slick lift-slab method to date.

Two-at-a-time—Concrete floor slabs were placed the full width and length of the building at ground level, then raised into place—two-at-a-time—by hydraulic jacks mounted atop the building columns. The slabs measure 215 ft. x 69 ft. x 9 in. and weigh 830 tons each. Thirty-six jacks were required to lift the gigantic 1,660-ton loads.

No "pour strips"—Ordinarily, with lift slab, each slab is cast in sections which are lifted separately. Pour strips are then formed and placed conventionally. On the Huron Towers project, each floor was cast *monolithically . . . without joints or pour strips* of any kind.

Strength, plus economy—Specifications originally called for a minimum of 6.5 bags of cement for 4000 psi concrete. Preliminary tests, however, showed that the *specified strength could be obtained most economically* by using 5 bags of cement and POZZOLITH . . . and provided the desired reduction in shrinkage that allowed construction of these large slabs without pour strips. This mix design was submitted, approved and used throughout the Huron Towers project. All tests on POZZOLITH ready-mix concrete exceeded the specified strength.

Master Builders MBVR air-entraining agent was also employed in all slab concrete to obtain the air content specified for the outer portion of each slab, which will ultimately be a cantilevered balcony exposed to weathering.

Aside from the record number of liftable slabs and the near-record lifting height, the Huron Towers project includes two other interesting features: The concrete casting operation and the method of winter protection.

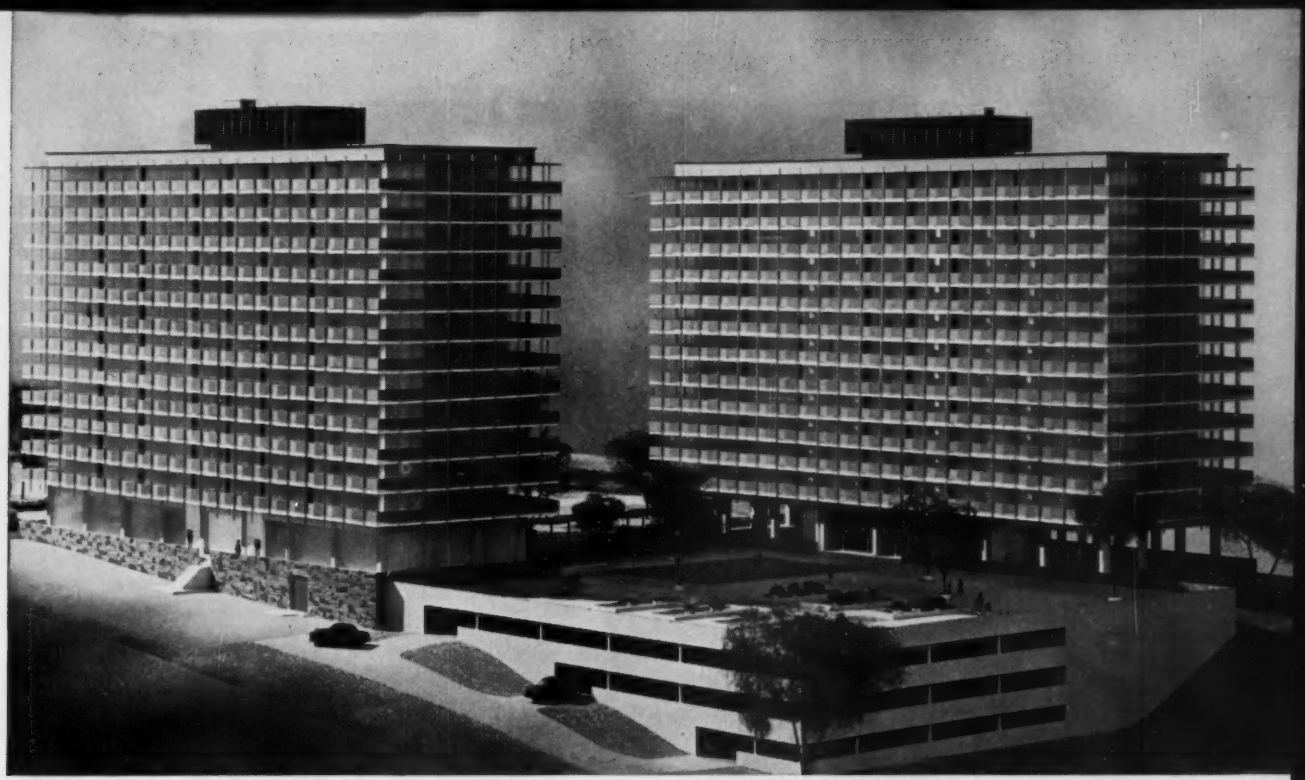
Contractor ingenuity—Since most of the floors in the two buildings are identical, the contractor developed a unique sequence of casting the slabs at the lower-basement floor level. One complete floor, covering nearly 15,000 sq. ft. and containing 410 cu. yd. of concrete, was cast in a three-day cycle. As soon as one crew had completed placement of the 33 tons of reinforcement and conduit for the floor slab in one building, it moved to the other building to begin preparing a new slab. At the same time, another crew placed concrete for the slab in the first building, pumping it into place through an 8-inch line, at a rate of 40 to 60 cu. yd. per hour, from a centrally-located pump.

Weather, or not—This sequence of slab-casting operations was maintained throughout the winter months by protecting the working areas from freezing by enclosing them with 75,000 sq. ft. of lightweight plastic material and maintaining a temperature of approximately 55 F. One-percent calcium chloride was added to the mix to accelerate early strength gain.

POZZOLITH concrete was used throughout both buildings for (1) *ease of pumping* . . . there were no plugged lines during the entire pumping operation (2) *virtually no honeycomb* . . . despite intricate reinforcing steel and electrical and mechanical work in the slabs (3) *minimized shrinkage and cracking* . . . inspection after lifting showed no cracks through the slab.

Approximately 12,000 of the 25,000 cu. yd. of POZZOLITH ready-mix con-

LOWER BASEMENT FLOORS in both buildings were cast on the ground to serve as casting beds for the liftable slabs. The ground floor and upper basement floor slabs are 14″ plus 2½″ joist-type slabs spanning onto wide flat beams of the same depth. The 12 apartment floors and the roofs are flat slabs, all 9″ thick except the first living floor, which is 10″.



HURON TOWERS, Ann Arbor, Michigan, was designed by King and Lewis Architects, Inc. with structural engineering by R. H. McClurg Associates, Inc.—both of Detroit. Project Manager was B. R. Sloan and Project Engineer, Willard C. Reeder—both of Long Construction Company, General Contractor, Kansas City, Mo. F.H.A. Resident Engineer was Hugh Foley. Lift slab Consulting Engineer was Robert D. Campbell, Kansas City, Mo. Killins Gravel Co. of Ann Arbor supplied the POZZOLITH ready-mix concrete.

TOWERS

MAXIMUM LIFTING HEIGHT of roof slab for this building was 145 ft. For its "twin"—142 ft. The number of liftable slabs—15, in this building, sets a record as the greatest number of concrete decks to be lifted in the United States. Total floor area of the two apartment buildings is 465,000 sq. ft.—431,000 of which were lifted.

crete were used in the lift slabs—the balance went into the foundation and attached parking garage.

Field service—Master Builders field man worked closely with the engineer, contractor and ready-mixed concrete producer on the Huron Towers job to aid in achieving the common goal of uniform, high-quality concrete at lowest cost-in-place.

No matter how large, how small, how unique or how conventional the project, call in the local Master Builders field man. He will show you how concrete produced with POZZOLITH is a more durable and versatile building material . . . superior in performance, quality and economy to plain concrete or concrete produced with any other product.

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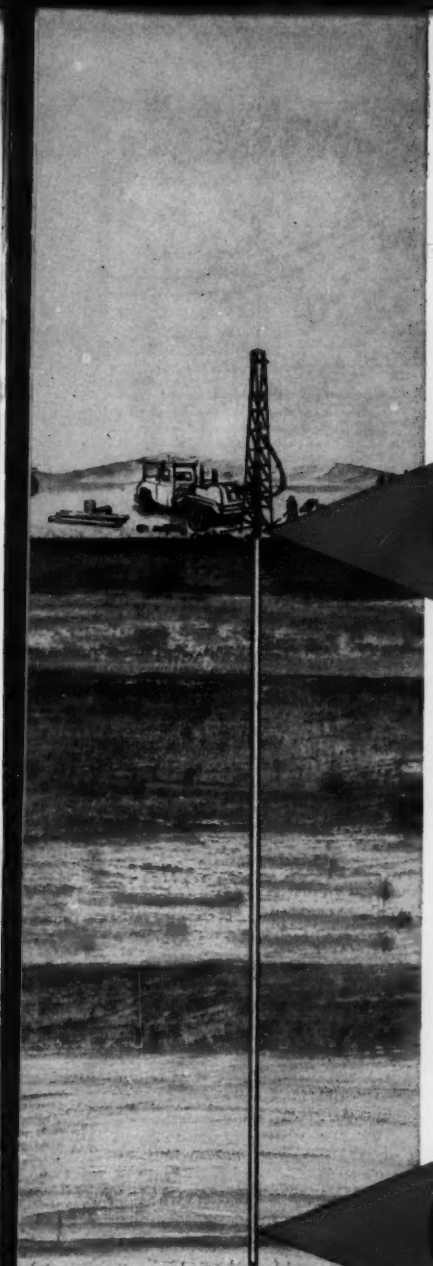

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Layne services do not replace, but coordinate with the services of consulting, plant and city engineers.

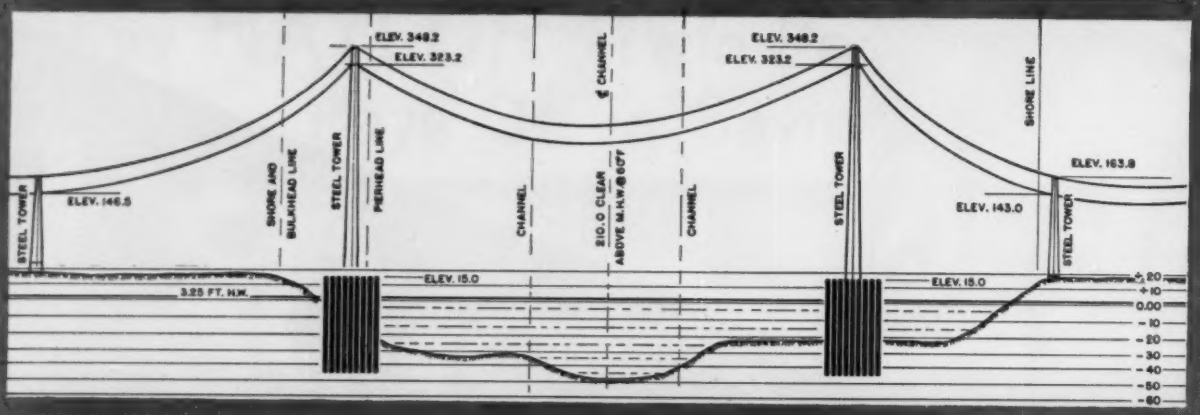
Layne
SINCE 1882
COMPLETE WATER SERVICE

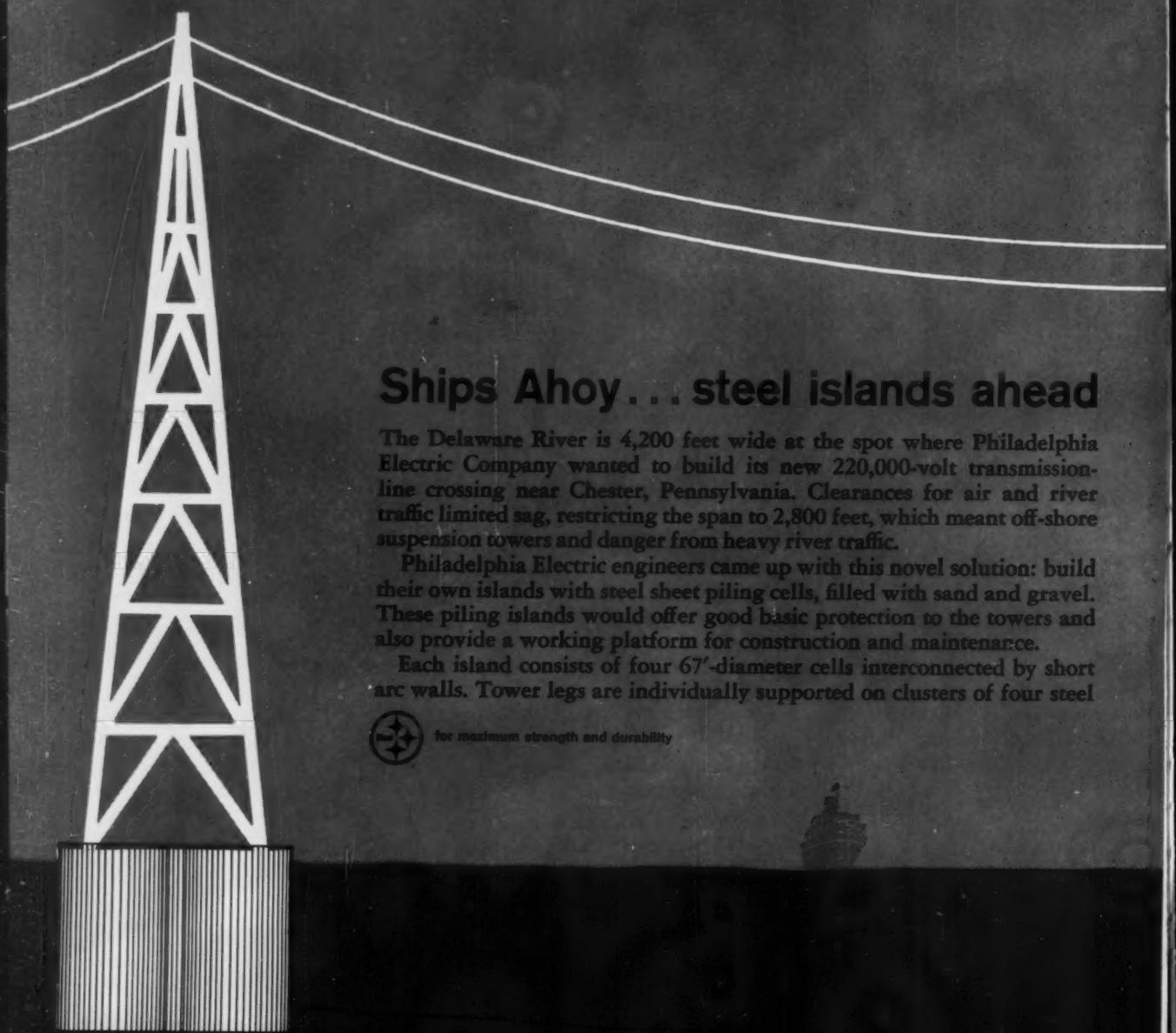
LAYNE & BOWLER, INC., MEMPHIS

General Offices and Factory, Memphis 8, Tenn.

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

SALES REPRESENTATIVES IN MAJOR CITIES





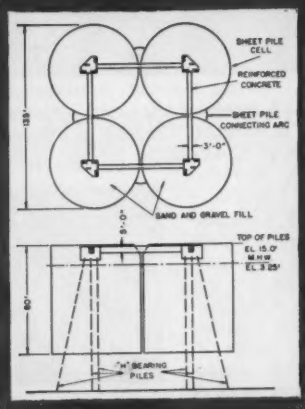
Ships Ahoy . . . steel islands ahead

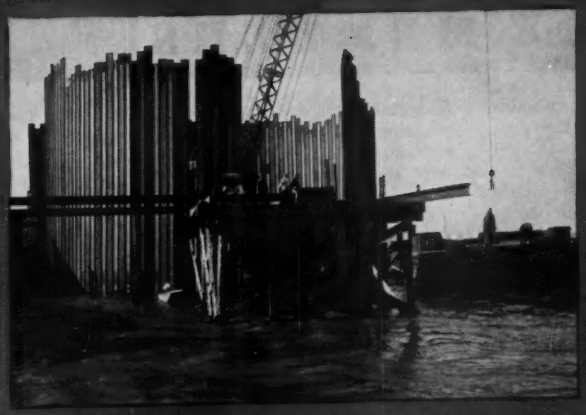
The Delaware River is 4,200 feet wide at the spot where Philadelphia Electric Company wanted to build its new 220,000-volt transmission-line crossing near Chester, Pennsylvania. Clearances for air and river traffic limited sag, restricting the span to 2,800 feet, which meant off-shore suspension towers and danger from heavy river traffic.

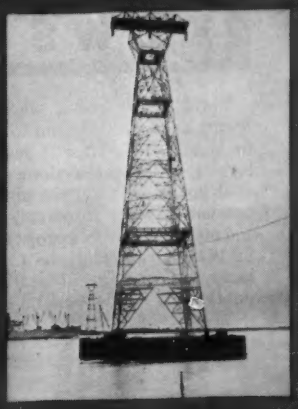
Philadelphia Electric engineers came up with this novel solution: build their own islands with steel sheet piling cells, filled with sand and gravel. These piling islands would offer good basic protection to the towers and also provide a working platform for construction and maintenance.

Each island consists of four 67′-diameter cells interconnected by short arc walls. Tower legs are individually supported on clusters of four steel

for maximum strength and durability







H-Piles driven to 90-ton bearing on rock. A total of 1,850 tons of USS steel sheet piling in sections MP-101 and MP-102 were required.

This foundation was designed on the basis that a cell could be destroyed without endangering the tower, although the islands are well out of the ship channel as shown by the plan at the upper left.

In support structures like this, steel sheet piling and H-Piles do the very best job, and at the lowest cost. Wherever you are building, you can get any type of piling when you want it from United States Steel. Just call our nearest office. For technical information write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

United States Steel Corporation • Columbia-Geneva Steel Division
National Tube Division • Tennessee Coal and Iron Division • United States Steel Export Company

USS United States Steel

TRADEMARK

NEWS OF MEMBERS

Floyd D. Peterson, who retired this Spring as special assistant to the President for public works after 31 years of Federal service, is now a consulting engineer, specializing in budgets, planning and development of water resources, public works and metropolitan area projects. From 1930 to 1944 he was with the Corps of Engineers, followed by 11 years as chief of public works in the Federal Bureau of the Budget. For his work in the public works planning field, he received, last January, a distinguished service award from President Eisenhower.

John H. Melvin, formerly general manager of the Pennsylvania Drilling Company, and onetime state geologist of Ohio, has assumed practice as a consulting geologist with headquarters in Pittsburgh.

MH Roll-call for water

the DEMON FIRE

Some of the largest and most modern water works systems in the U.S. are located here in the east-north-central States. It is hard to believe that here 90 years ago, a sprawling, shambling frontier city built of wood, practically burned to the ground when Mrs. O'Leary's cow kicked over a lantern. The Chicago Fire in 1871 was one of the first great disasters of U.S. history. It destroyed $200 million in property and took 250 lives.

U.S. Department of Commerce lists 85 midwest cities today as having adequate and efficient water works, with an overload capacity 20% in excess of maximum-day load. But the Department also lists 16 midwest water works as inadequate and 18 additional water systems as definitely deficient! Here lives some 15 million Americans – But over 3 million of them have inadequate water supply facilities!

Annual property loss from fire in the U.S. in 1959 was in excess of 1 billion dollars. At the same time, approximately half of the water works facilities of the U.S. are inadequate or deficient in capacity. Considering present water distribution deficiencies and increasing demand due to population growth, it is estimated that water supply facilities will need to be doubled within the next 20 years.

Ohio
Indiana
Illinois
Michigan
Wisconsin

M&H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA

George S. Robinson last month reported for duty in Bangkok, Thailand, as officer-in-charge of Construction for the U. S. Navy in Southeast Asia. A Captain in the Navy Civil Engineer Corps, for the past two and one-half years he was stationed at the Norfolk Naval Shipyard as public works officer. Past assignments were as chief of operations of the Joint Construction Agency in Paris, and technical adviser to the Shore Establishments Division, Bureau of Aeronautics, Washington, D.C.

Alvin F. Meyer, Jr., chief of the Strategic Air Command's Bionucleonics and Environmental Health Branch, has been selected to attend the Industrial College of the Armed Forces. His departure ends a seven-year assignment to the office of the Command Surgeon at the Offutt Air Force Base in Nebraska. Concommitant with his assignment to SAC Headquarters, Colonel Meyer held an appointment as assistant professor in the Department of Preventive Medicine and Public Health at Creighton University in near-by Omaha.

P. C. Vickers is a new assistant director in Union Carbide's Design and Construction section. Mr. Vickers who joined Carbide in 1940, previously served as a department head in Design and Construction and at the time of his recent appointment was manager of design engineering in Design and Construction at the Technical Center in South Charleston, W. Va.

William J. Hedley, Vice President of ASCE, was recently on the four-man panel which selected winners in the National Jaycee Community Development program. The three top Jaycee chapters in Community Development—Harvey, N. D.; Grass Valley, Calif.; Oconto, Wis. —will share in the $3,000 prize money.

Nicholas H. Piteo, since 1957 traffic engineer of the Esso Safety Foundation—recently renamed Humble Safety Foundation—as the new director will coordinate its projects with work in the highway-safety field already under study by the parent group, the Humble Oil and Refining Company.

S. M. Bailey, after more than 30 years of service with the Army Corps of Engineers, recently retired as chief of the Engineering Division of the Louisville District. Mr. Bailey, one of the pioneers in the field of flood control, has done major work in the Ohio River Valley area.

Edward Wenk, Jr., former scientific consultant tc Congressional committees, has been named executive secretary of the Federal Council for Science and Technology. An authority on the design of submarines, he will also serve as a technical assistant to **Jerome B. Wiesner,** special assist-

ant to the President for science and technology. For the last two years, Dr. Wenk has been senior specialist in science and technology at the Library of Congress' legislative reference service.

Clifford D. Williams, during 41 years of engineering practice has gained wide experience in the fields of sanitary, industrial, municipal and general engineering, and is therefore well qualified to offer consulting services in these areas through his new firm of C. D. Williams & Associates, of 1331 Greene Street, Augusta, Ga. Although Mr. Williams is leaving Patchen, Mingledorff and Williams where for the past three years he has been a partner and director, he will nevertheless continue as the United States representative of the Mexican organization of Patchen, Mingledorff, Williams and Benet. Formerly head professor of civil engineering at the University of Florida for seven years and similarly at Fenn College for five years, several of Mr. Williams' engineering books have been adopted as texts in more than 100 colleges and universities.

John D. McElheny, a Colonel in the U.S. Army and since 1958 a Lieutenant Governor of the Panama Canal Zone, has been reassigned to the Office of the Deputy Chief of Staff for Logistics, in the Pentagon, Washington, D.C.

Sidney F. Borg, head of the civil engineering department at the Stevens Institute of Technology, has been appointed by the American Arbitration Association to its National Panel of Arbitrators. Dr. Borg will serve in disputes over the performance of commercial contracts.

John A. Robison, who practiced engineering with the State of Mississippi for 12 years, a consulting firm for 18 years, and in private practice for five years, has opened an office in Potts Camp, Miss. In recent years, in addition to acting as consultant to the Iraqi government on engineering problems, Mr. Robison has worked on development of the hydroelectric power and water uses of the Jordan River.

Byron E. Ruth, starting with the fall term, will be an instructor in civil engineering at West Virginia University. Mr. Ruth, in addition to teaching at Purdue University and at the Army Engineers School at Fort Belvoir, Va., is an inventor or co-inventor of several processes and mechanisms used in the construction industry.

F. L. Endebrock, a Captain in the Civil Engineer Corps of the U.S. Navy, recently reported for duty on his new assignment as public works officer and as resident officer in Charge of Construction, BUDOCKS Contracts, at the Argentia Naval Station in Newfoundland. Previously Captain Endebrock served for three years as deputy district public works officer of the Eighth Naval District at New Orleans, La.

(Continued on page 20)

who framed this engineer?

He was Sanitary Engineer working on the construction of an Air Force base in Texas*. He's a good engineer—asked for the right kind of sanitary sewer pipe. But the regulations read "lowest bidder," so he got a substitute that he didn't want.

Six years later the substitute pipeline had to be dug up, at tremendous expense to the taxpayer. Everybody forgot by that time that the framed engineer had screamed for the right pipe in the first place.

Before the war, only Lifetime Vitrified Clay Pipe was used in sanitary sewers on Federal projects. During the war, the Clay Pipe people couldn't keep up with the sudden, unprecedented demand, so standards were lowered to allow substitutes.

There's no Clay Pipe shortage now, and there's still no real substitute for Lifetime Vitrified Clay.

But outmoded Federal, State and Municipal regulations haven't been changed. They can mean many more framed engineers.

And taxpayers are forced to spend millions of dollars each year to replace sewer lines that should have been installed with lifetime pipe—Vitrified Clay Pipe with new cost-cutting factory-made compression joints—in the first place.

Name of Air Force base on request.

COMPRESSION SEALED, VITRIFIED
CLAY IMPERVIOUS PIPE
THE STANDARD in SANITARY SEWERS

NATIONAL CLAY PIPE MANUFACTURERS, INC.
1028 Connecticut Avenue, N.W.
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1028 Connecticut Ave., Washington, D. C.

Please send me full details on the new factory-made compression joints on Clay Pipe.

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(company)

(street address)

(city and state)

8-7C23 CE

15 ways to save

The king of the long span is also the economy ace in short span bridge construction, particularly in view of recent developments involving design, materials, and methods. A new grade of steel, new steel sections, new design ideas, broader applications of tried and true auxiliary details—in all, a total of 15 opportunities for a bridge designer to reduce the cost of a structure, to build more bridges within his budget, without the least sacrifice in quality.

Design your next short span project in steel, applying these recent developments to the optimum. You'll be pleasantly surprised at the cost.

Write for our free booklet, "36 Ideas for Tomorrow's Short-Span Bridges."

USS is a registered trademark

1. Specify new ASTM-A36 steel instead of ASTM-A7 for main structural supports in spans of 20′ and longer. ASTM-A36 offers 10% more allowable stress, so it cuts weight about 6%, cuts costs from 3%-5%.

2. Replace conventional ASTM-A373 with ASTM-A36 for better weldability and save $2-$6 a ton.

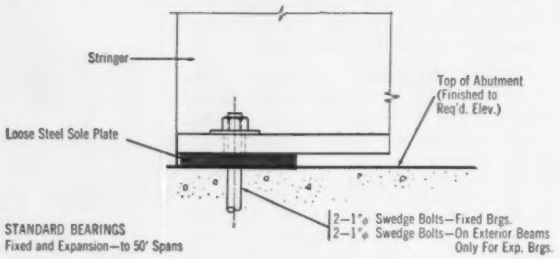
3. Where the new lightweight wide flange sections can be used in place of former minimum sections, weight reduction of about 10% can be achieved in beam spans.

4. Use all-welded construction to simplify detail, reduce weight and cut fabrication cost through the elimination of riveted or bolted attachment of stiffeners, diaphragms and shop splice material.

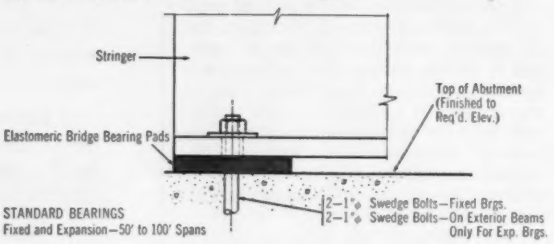
5. Design for composite beam and slab action in spans over 50′ to reduce weight and cost. The shallower floors provide greater underpass clearance, lessen approach embankment costs and reduce structural steel weight as much as 30%.

6. Replace long series of heavy simple spans with more efficient continuous spans and save 15%-30% and more in weight. Use the AISC publication, "Moments, Shears and Reactions, Continuous Highway Bridge Tables" (AIA File No. 13-C) to save design time.

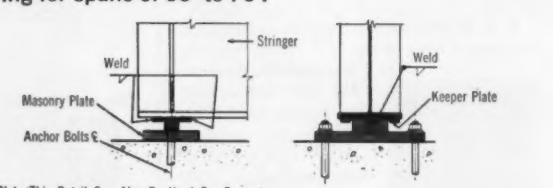
7. Simple steel shoes for spans up to 50′. For low bearing pressures where deflection is not a problem, use simple steel plate for both sole and masonry plate at both fixed and expansion ends on spans up to 50′.


Stringer
Top of Abutment (Finished to Req'd. Elev.)
Loose Steel Sole Plate
2—1"ϕ Swedge Bolts—Fixed Brgs.
2—1"ϕ Swedge Bolts—On Exterior Beams Only For Exp. Brgs.
STANDARD BEARINGS
Fixed and Expansion—to 50′ Spans

8. Simple elastomeric shoes for spans up to 100′. Specify elastomeric pads for bridge shoes on spans up to 100′ to cut costs considerably.


Stringer
Top of Abutment (Finished to Req'd. Elev.)
Elastomeric Bridge Bearing Pads
2—1"ϕ Swedge Bolts—Fixed Brgs.
2—1"ϕ Swedge Bolts—On Exterior Beams Only For Exp. Brgs.
STANDARD BEARINGS
Fixed and Expansion—50′ to 100′ Spans

9. Fixed bearing plates for spans over 50′. Use fixed bearings with a combination masonry plate and rocker for spans of 50′ to 100′ where metallic shoes are preferred and deflection is a problem. A wide slot in the keeper plate will provide an adequate expansion bearing for spans of 50′ to 70′.



Note/This Detail Can Also Be Used For Expansion Bearings By Enlarging Slot In Keeper Plate. (Spans—50′ to 70′)

FIXED BEARING AT ABUTMENT
Spans Over 50′

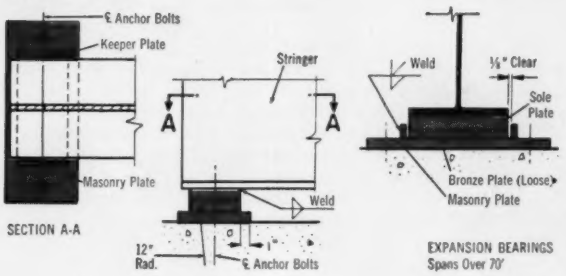
General Offices: 525 William Penn Place, Pittsburgh, Pa. Contracting Offices in: Ambridge Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas • Denver Detroit • Elmira • Gary • Harrisburg, Pa. • Houston • Los Angeles • Memphis • Minneapolis New York • Orange, Texas • Philadelphia • Pittsburgh • Portland, Ore. • Roanoke • St. Louis San Francisco • Trenton • United States Steel Export Company, New York

American Bridge Division of United States Steel

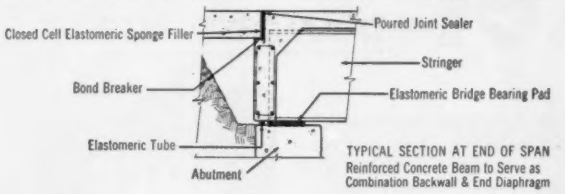
USS

money on short span bridges

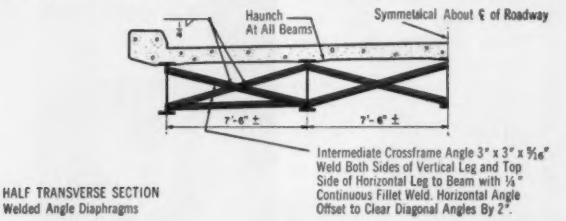
10. Sliding bronze expansion plates for spans over 70′. Specify bronze sliding rocker plates for economical expansion bearings on spans over 70′. Keeper bars need be placed only at the sides to prevent lateral movement.



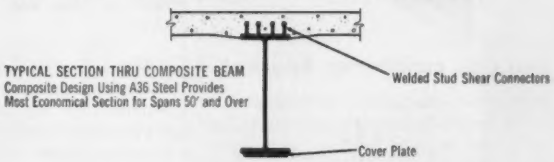
11. Eliminate structural diaphragms and backwalls at abutments. Use concrete diaphragms to provide support for approach slabs, and to replace conventional abutment backwall. Closed cell elastomeric sponge filler and point joint sealer replace costly expansion dams.



12. Welded angle diaphragms lead to simplification. Use panels welded directly to the webs of stringers for simple transverse bracing. Note the absence of top struts and use of a bottom strut only in outer panel.


Haunch At All Beams
Symmetrical About ℄ of Roadway
7′-6" ±
7′-6" ±
Intermediate Crossframe Angle 3" x 3" x 5/16" Weld Both Sides of Vertical Leg and Top Side of Horizontal Leg to Beam with ¼" Continuous Fillet Weld. Horizontal Angle Offset to Clear Diagonal Angles By 2".
HALF TRANSVERSE SECTION
Welded Angle Diaphragms

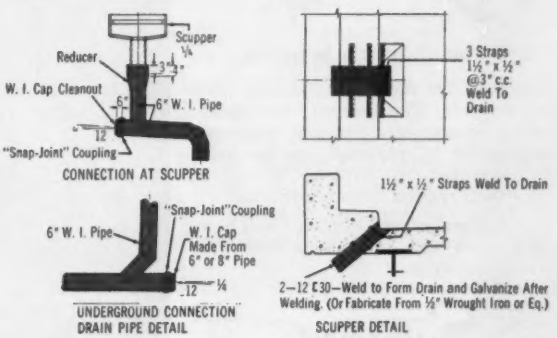
13. Welded stud shear connectors simplify fabrication. Use welded stud type shear connectors for composite design to facilitate shop and field assembly. Keep studs to a minimum, by using largest size studs.


TYPICAL SECTION THRU COMPOSITE BEAM
Composite Design Using A36 Steel Provides Most Economical Section for Spans 50′ and Over
Welded Stud Shear Connectors
Cover Plate

14. Use welded field splices to cut costs. Use welded field splices for fabrication and erection economy when all other field connections are welded as suggested under item 4.

Web Hole For Welding (Permanent)
Extension Blocks (Remove After Welding)
Top View
TYPICAL FIELD WELDED BEAM SPLICE
For Continuous Design

15. Welded drainage details simplify design and eliminate expensive castings. Use combination scuppers and conduits for drains not requiring connection to sewers. Use wrought iron pipe with corrosion-resistant weldments for scuppers for larger drains connected to sewers. Note the use of "snap-joint" couplings for easy removal for cleaning.


Scupper
Reducer
W. I. Cap Cleanout
6" W. I. Pipe
"Snap-Joint" Coupling
CONNECTION AT SCUPPER
3 Straps 1½" x ½" @3" c.c. Weld To Drain
1½" x ½" Straps Weld To Drain
"Snap-Joint" Coupling
6" W. I. Pipe
W. I. Cap Made From 6" or 8" Pipe
UNDERGROUND CONNECTION
DRAIN PIPE DETAIL
2—12 C 30—Weld to Form Drain and Galvanize After Welding. (Or Fabricate From ½" Wrought Iron or Eq.)
SCUPPER DETAIL

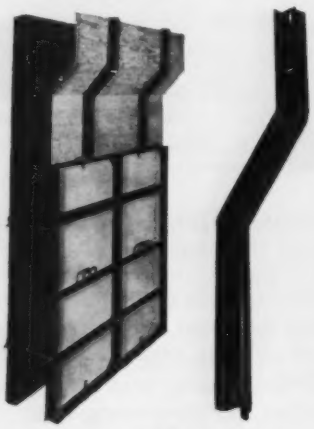
This mark tells you a product is made of modern, dependable Steel.

New Products

for concrete forming

Symons cantilever bracket

Purpose of the cantilever bracket is to support inside form work and thus allow a difference in form heights for a monolithic wall-slab pour. An economical way to pour swimming pools, sewage treatment plants, and any other type work requiring a monolithic wall and base slab pour. Designed particularly for use with Symons Steel-Ply Forms.



Symons haunch bracket

Designed for pouring haunches, corbels or offsets. The brackets are made to order to any size the job requires. Designed for ¾" plywood, the brackets are connected to Symons Steel-Ply Forms with regular form hardware.

For further information on these new products, as well as Symons Steel-Ply Forms, just write:

Symons

SYMONS CLAMP & MFG. CO.

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MORE SAVINGS FROM SYMONS

Harold E. Babbitt, professor emeritus of sanitary engineering at the University of Illinois, will spend the 1961-1962 school year in India as part of a team of engineers and technical experts from America who will teach and work with Indian educators and researchers toward improving the engineering colleges of that nation. The project is being carried out under the International Cooperation Administration and Wisconsin State University. During his stay Professor Babbitt will be associated with the University of Roorkee.

Benjamin Saltzman was elected to the office of president of the Building Officials Conference of America at its recent annual meeting. Mr. Saltzman is currently borough superintendent in the New York City Department of Buildings, with offices in Brooklyn. He originally joined the department in 1926 and has since served in various capacities, becoming chief engineer in 1944 and borough engineer in 1946.

Ray L. Derby, Otto E. Eckert, and **Fred Merryfield** have been elected to Honorary Membership by the American Water Works Association. Mr. Derby is currently principal sanitary engineer in the Los Angeles Department of Water and Power; Mr. Eckert is general manager of the Board of Water and Electric Light Commissioners in Lansing, Mich.; while Professor Merryfield, who is a past Association director, vice president, president, and winner of its Fuller Award and Diven Medal, in 1944 and 1959 respectively, teaches sanitary engineering at Oregon State College. Included among this year's prize winners are **Lewis S. Finch** whose "tireless and unselfish efforts in the successful launching and carrying forward of the Association's Advancement program," earned him the Diven Medal for 1960, and **William R. Seeger,** recipient of the Management Division Award for his paper "Duties and Responsibilities of the Water Utility Manager." Mr. Seeger is assistant general manager and chief engineer of the Marin Municipal Water District at San Rafael, Calif.

W. L. Raymond, Jr., was recently promoted from project engineer in the Highway Division of Gannett, Fleming, Corddry and Carpenter to head of its Traffic Section. In this latter capacity he will be responsible for traffic estimates for all proposed projects being studied by the Highway Division as well as parking and traffic studies within the Traffic Section.

Marvin Gates has been named president and **Francis V. Rossi,** vice president-treasurer, of Construction Estimating, Inc. in South Windsor, Conn. Mr. Gates previously was affiliated with several consulting engineers and contractors, including the De Leo Bros. Construction Company; while Mr. Rossi has been employed in various supervisory and administrative capacities in connection with major New England construction projects since 1946.

(*Continued on page 22*)

acker

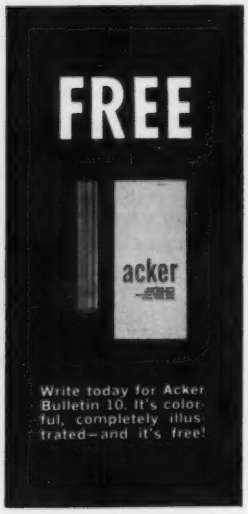
BEST DEAL IN DIAMOND BITS

Look for the Acker diamond seal – the sign of quality around the world.

You can't beat the high recovery – low cost combination you get with Acker diamond bits.

Top quality, selected stones are set by craftsmen in Acker's own modern plant. Painstaking inspections assure quality control. Backed by forty years' experience in drilling design and development, superior quality is bound to result.

But you don't have to take our word for it! Acker diamond bits are proving themselves in the field. See for yourself. Try Acker on your next job!



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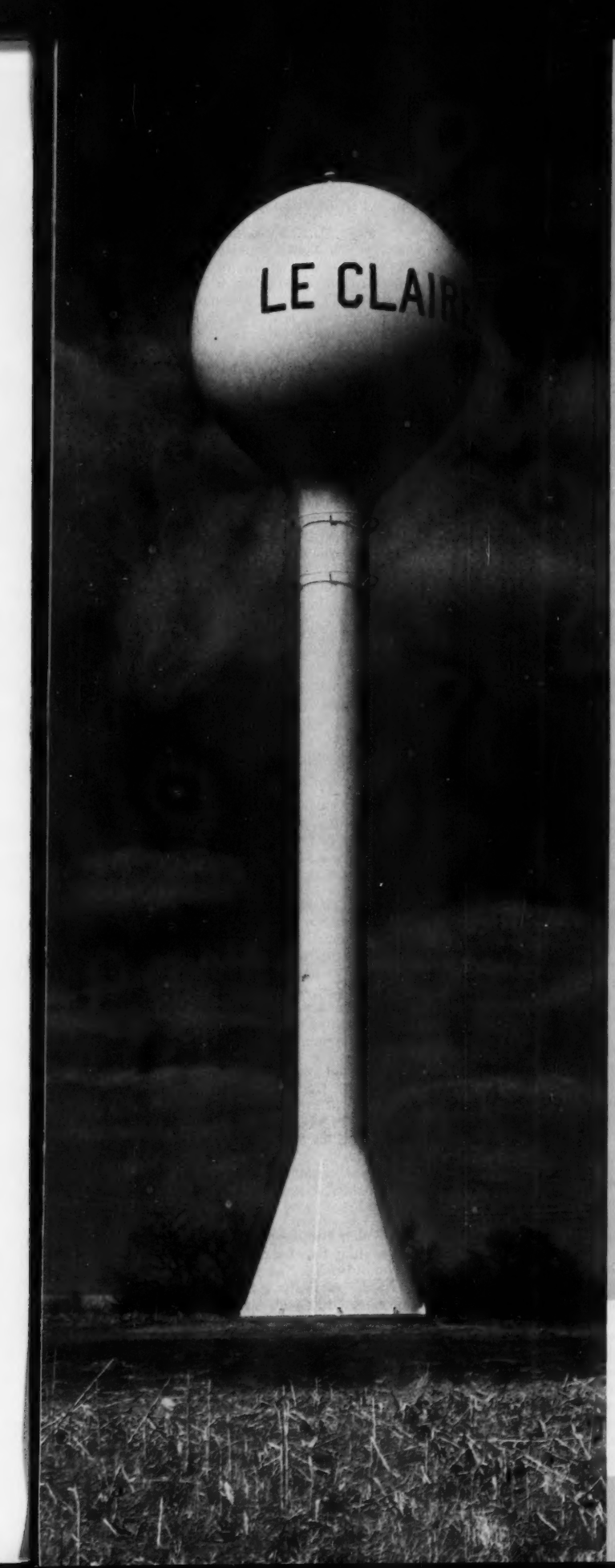
Over 40 years of experience manufacturing a complete line of diamond and shot core drills, accessories and equipment.

ACKER DRILL CO., INC. P. O. Box 830 Scranton 2, Pa.



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2. Minimum ground area required.
3. The base can be used for pumping and filtering equipment or for storage. Separate costly buildings are not necessary.
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built it!

CB-618

DOWN TO FUNDAMENTALS

SERVICE IS BASIC AT KERN

KERN instruments are rugged, and designed to withstand all ranges of climatic conditions. But when the need arises, KERN INSTRUMENTS INC. makes available the same technical repair service as our Swiss factory. Skilled, reliable Swiss technicians, trained in the home plant, and having fundamental, specialized knowledge of KERN instrument, are always on hand to serve you efficiently in our modern, fully equipped instrument shop.

Kern KERN INSTRUMENTS, INC.
FUNDAMENTAL SURVEYING EQUIPMENT
120 Grand St., White Plains, N.Y.

John Girand, has been appointed to serve for a three year term on the Arizona State Board of Technical Registration. President of Johannessen & Girand, Inc., the oldest engineering firm in Arizona, he has had more than 30 years of professional practice and has directed the management of his firm for the past 20 years. Mr. Girand is a past president of the Arizona Section.

Warden W. Gano, for the past several years in charge of the Civil Engineering Branch of the Division of Engineering in the Washington, D.C., office of the Forest Service, has been transferred to the regional office in Portland, Ore., where he will be chief of the Division of Engineering. **Clayton G. Seltz,** after several years as chief of the Roads and Trails Branch of the Division of Engineering at the San Francisco regional office, will succeed Mr. Gano in the Washington office. Another Forest Service employee, **E. Raymond Huber,** after almost 30 years of service, will retire in October of this year. His position as chief of the Division of Engineering in Albuquerque, N. Mex., will be taken over by **Roger J. Nelson,** who has headed the Roads and Trails Branch of the Division in Portland.

R. S. Kelley, Colonel and chief of the Military Personnel Division in the Office of the Chief of Engineers, has been named director of Personnel. At the same time **A. H. Frye, Jr.,** Colonel and deputy director of Military Construction in the Office of the Chief of Engineers, was reassigned as division engineer of the South Pacific Division in San Francisco, Calif.

J. Roy Fraser, whose experience includes design and sales of precast-prestressed concrete bridge and building members, recently left the Link-Belt Company where he was Southeastern Division engineer to become assistant sales manager at LEAP Structural Concrete, Inc. While with Link-Belt, Mr. Fraser designed and supervised the structural system and foundations for the world's longest belt conveying system (CIVIL ENGINEERING, February 1960, page 38)—the unique feature of which is the reinforced monolithic and precast-prestressed concrete supporting structures.

Donald M. Ditmars and **David W. Carmichael** have joined forces to establish the consulting firm of Ditmars and Carmichael at 20 Nassau Street, Princeton, N. J.

Albert Fry, chief of the Tennessee Valley Authority's Hydraulic Data Branch, recently left the TVA after 28 years of service. During those years, Mr. Fry became internationally known in the fields of hydraulics and hydrology, developing TVA's Hydraulic Laboratory into one of the most outstanding in the country, and pioneering in watershed hydrology and river forecasting procedures. A leader in ASCE affairs, Mr. Fry was largely responsible for the organization of the Mid-South and Tennessee Valley Sections. In addition he was chairman of many national and local Section committees, his most recent achievement being the direction of the Tennessee Valley Section's successful UEC campaign.

Charles W. Thomas, a hydraulic engineer at the Denver Engineering Laboratories of the U.S. Bureau of Reclamation, recently left for Formosa to begin a one-year assignment on an international eight-man team which will study the island's water resources under the sponsorship of the Bureau of Technical Assistance Operations of the United Nations. A specialist in laboratory studies of models of hydraulic structures and in the field of sedimentation, Mr. Thomas has served continuously since 1930 (with time out for Army service) with the Bureau of Reclamation.

Verne Ketchum, upon his retirement from active practice was honored by the American Institute of Timber Construction membership and Standards Committee. Well-known as an engineer, author and speaker, Mr. Ketchum was most recently director of engineering at Timber Structures, Inc., in Portland, Ore.

Robert A. Skinner, since 1952 assistant chief engineer of the Metropolitan (Los Angeles) Water District, will succeed retiring **Robert Diemer** (CIVIL ENGINEERING, August 1961) as general manager and chief engineer of the District. Mr. Skinner has been with MWD for 28 years and has been the chief negotiator for the group in its relations with the State's Department of Water Resources and the State Legislature on the Feather River Project. This won popular vote approval of the $1.75 billion project a few months ago. He is a former president of the Los Angeles Section.

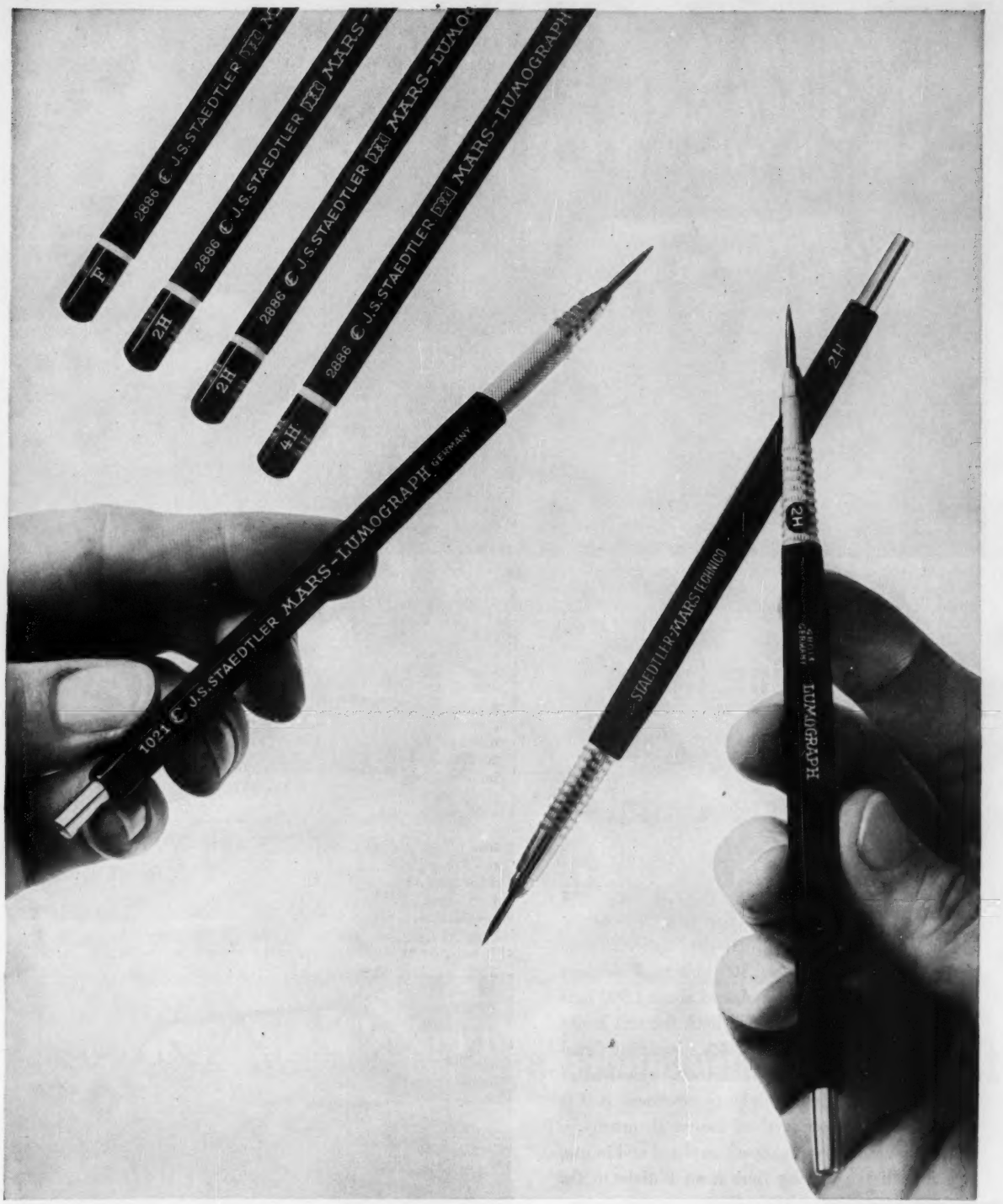
Harry C. Plummer, director of engineering and technology for the Structural Clay Products Institute, was made a fellow of the Construction Specifications Institute at its recent annual convention in New York City. The first non-architect to receive this honor, he has been secretary-treasurer of the organization for the past six years.

A. Faul will head the Iowa State Highway Commission's newly formed Division of Engineering in his capacity as director of engineering. In his 41-year career with the Highway Commission, Mr. Faul has held the positions of materials inspector, acting resident engineer, laboratory chief, assistant materials engineer and, since 1959, materials engineer.

Walter Hiram Frick announces that the consulting firm bearing his name and the firm of Frick & Sweeney, consulting architectural engineers, have moved their offices to 330 South Evaline Street, Pittsburgh, Pa.

John A. Clark, Captain in the U.S. Naval Reserve, ended his military career recently after 24 years of combined active and reserve duty. His last assignment was as Reserve "Seabee" program officer for the 12th Naval District.

(*Continued on page 142*)



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Some 5,200 tons of Bethlehem steel piling were used in constructing this portion of the Niagara Thruway for the State Department of Public Works. General contractors: Stimm Associates, Inc.; Thruway operator: New York State Thruway Authority; Consulting engineers: Harold J. Senior (Senior, Bissell & Bronkie), Williamsville, N. Y., and Clarke & Rapuano, New York.

Steel piling helps traffic flow again on old Erie Canal

An abandoned section of New York's Erie Canal was chosen as the route for part of the Niagara Thruway which connects Buffalo with Niagara Falls. To support the road bed, some 3,300 tons of Bethlehem H-piles were driven to refusal, and about 1,900 tons of Bethlehem sheet piling held back the soft banks of the canal and the adjacent Black River Ship Canal during highway construction. Actually, elevation of the lowest point of this highway pavement is 9 ft below the high-water level of the canal, nearby.

The Niagara Thruway, now completed and in use, cuts in half the driving time from Buffalo to the Niagara Falls area.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.
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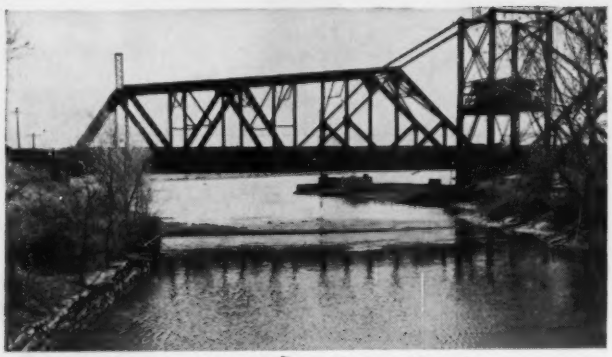

Horses and mules once tramped the towpath along the bank of this section of the Erie Canal, known as Black Rock Lock.

Today a modern 4-lane concrete highway lies on the canal site. About 1,200 tons of Bethlehem concrete reinforcing bars were also used in constructing this section of the Thruway.

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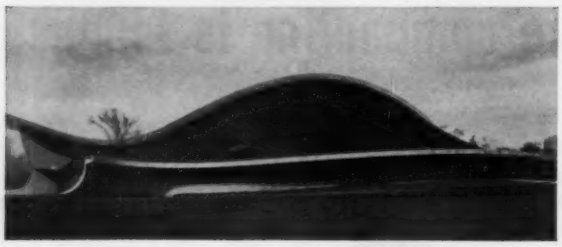

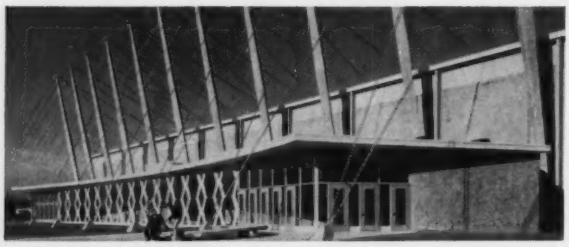

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Public works are featured in this issue? As an introduction to Public Works Week, October 1 through 7, this issue concentrates on urban renewal, on treatment plants for water and sewage and industrial waste, on plans to reduce traffic congestion in the nation's cities—all basic aspects of local public works programs.

■ ■ ■

Two out of every three Americans live in cities now? In fact, data from the 1960 Census show almost 70 percent of the population numbered among urban dwellers—a 6 percent rise from 1950 Census figures. If the trend continues, it is expected that 85 percent of the population will be living in cities by the year 2000. This means ever-growing demand for municipal services and improvements —last year almost $15 billion went for municipal projects.

■ ■ ■

The greatest metropolis of all time is developing on the East Coast of the U. S.? According to the U. S. Bureau of the Census, the Eastern U. S. has a growing super-metropolitan area with 31.5 million inhabitants. Extending from New Hampshire to Virginia, the 32 contiguous metropolitan areas include Boston, New York, Philadelphia, Baltimore, and Washington, as well as 35 other large central cities.

■ ■ ■

Publicly owned projects represented 34 percent of all construction contracts let in the first half of 1961? This means that for the second year in a row public ownership increased its first-half share of the market—it was 33 percent in 1960 and 31 percent in 1959. The Dodge Corporation attributes the increase to gains in contracts for schools, public buildings, public housing, and publicly owned heavy engineering projects.

■ ■ ■

The U. S. will build 14 million new homes during the sixties? An estimate from the University of Michigan Bureau of Business Research also foresees construction expenditures of $234 billion for new homes and home improvement in the next decade. This is nearly one and a half times the sum spent for such purposes in the past decade.

■ ■ ■

Do-it-yourself work is an important element in home maintenance? Last year $3 out of every $10 spent on home upkeep went for do-it-yourself projects, the Bureau of the Census reports. The $3 billion spent for such projects last year takes into account only the cost of materials and does not include labor costs or charges for needed tools and equipment.

■ ■ ■

In the next fifteen years the nation needs to spend at least $44 billion on water and sewage facilities? This would mean expenditures at the rate of $2.6 billion a year—about twice the average rate of outlays for water and sewerage needs since 1946. Estimates are from the U. S. Department of Commerce.

■ ■ ■

The Bay Area (San Francisco) rapid transit system will be one of the great construction projects of modern times? Consulting engineers estimate a ten-year construction period, with a construction payroll of $300 million to $400 million. An average annual labor force of at least 3,500 will be required for about a decade, and peak-labor force of 8,500 for many months. Some 410,000 tons of steel and 3,000,000 cu yd of concrete will go into the project. Plans suffered a set-back when use of the Golden Gate Bridge for rapid-transit trains was rejected.

■ ■ ■

The U. S. has 3,500,000 miles of roads? Data compiled by the Bureau of Public Roads show that there are slightly over 3,000,000 miles of rural roads. This is 88 percent of the U. S. total. The 416,000 miles of municipal roads and streets account for the remaining 12 percent. Slightly over 1,000,000 miles of all roads and streets are still unsurfaced, but such mileage has been decreasing in recent years at an average annual rate of 3 percent. The Bureau says the nation's needs lie in improvement or replacement of existing highways rather than in more mileage.

■ ■ ■

The job market is up for engineering graduates? Recession or no recession, there are about 3 percent more jobs for 1961 engineering graduates than there were in 1960, according to the Engineering Manpower Commission of Engineers Joint Council. As of June 15, 91.8 percent of the engineering graduates queried either had definite jobs or other commitments (including plans for postgraduate study and military service). The outlook for graduates in the liberal arts and physical science group compared favorably with the engineering outlook, but commitments in the business and commerce groups were 11 percent below engineering commitments. The EMC survey was based on responses from 138 engineering schools, representing about half of the 1961 graduating class.

■ ■ ■

That ASCE is moving September 1? Our new address: United Engineering Center, 345 East 47th Street, New York 17, N.Y. Our new phone: Plaza 2-6800.

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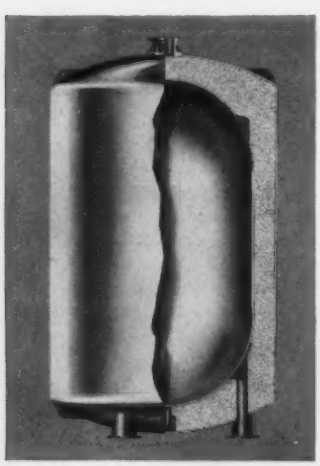

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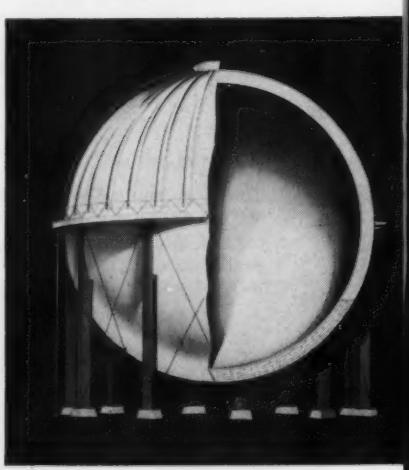

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a good move . . . for ASCE

On September fifth 1961, a milestone in the march of events was realized when The American Society of Civil Engineers and eighteen other leading engineering societies, agencies and organizations were consolidated under a single roof . . . the United Engineering Center. Inevitably, the Center will be one of the world's most important points of contact for those interested in engineers and engineering. As Herbert Hoover, Honorary Member of the ASCE, put it at the ground-breaking ceremony:

"Within the (engineering) societies is constant exchange of discovery, improvements and experience . . . findings printed for all the world to see. The engineer starts with these stimulants to imagination . . . makes a plan on paper. Then he moves to its realization in cement, in metal, in stone and in energy. Thus he brings jobs and better homes. This is high privilege.

". . . this great center is to facilitate these goals. It will play a great part in American life . . . serve all mankind."

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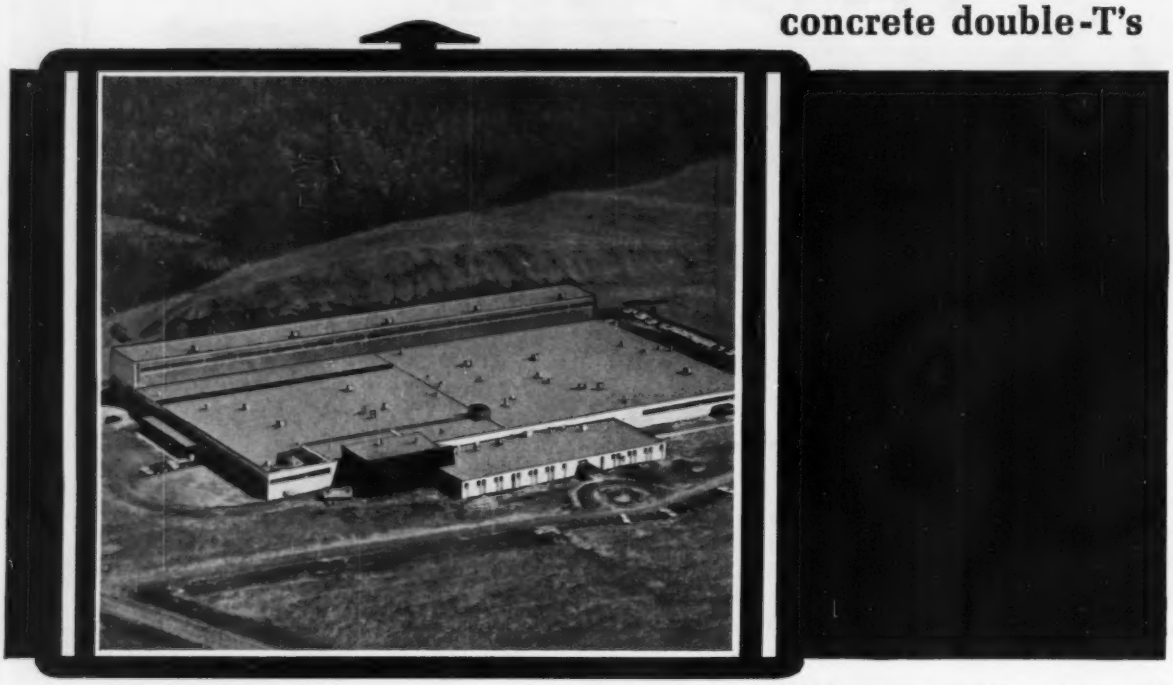

Rapid construction, fire resistance, and spaciousness were the key factors in the choice of precast, prestressed concrete design for the new 250,000-sq ft Lynchburg Works of Delta Star Electric Division, H. K. Porter Company, Inc. Use of prefabricated concrete girders, beams, roof and floor units, and canopies helped meet a construction schedule of only eight months. On some days as much as 20,000 sq ft of double-T roof deck was erected.

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CIVIL ENGINEERING

A place for the civil engineer—

in evaluation and management of water resources projects

REED A. ELLIOT, F. ASCE, Chief Water Control Planning Engineer
Tennessee Valley Authority, Knoxville, Tenn.

The engineering profession has not taken sufficient interest in the economic appraisal and management of water resources developments. Interest has not been lacking in design and construction, where the services of the engineer are essential and there is no substitute. By training, and by his very nature, the engineer is inclined strongly toward physical accomplishment based on the application of his scientific knowledge. The engineering schools start their students firmly in this direction, and the publicity given to engineering and the works of engineers tends to foster this emphasis.

Our own publications and meetings usually devote only modest time and effort to the economic and social relationships that are so basic to the conception and initiation of much of our work. It is essential that our scientific findings and advances in construction techniques should be fully reported, but there is room for a better balance. Certainly, the best design and construction solutions are meaningless unless the planning has been fully adequate.

Why this lack of interest?

There are some fundamental reasons for less than the fullest interest on the part of the profession in matters of project evaluation and management. One is that in general the engineer builds and moves on. This statement is an oversimplification, but it contains some truth. It is uncommon for the engineer responsible for the design and construction of a structure or project to stay on to manage his work so as to obtain the fullest use of it and to deal with the management problems that arise.

Another weakness in the attitude of the profession as a whole may stem from the fact that much of the development work in water resources is done by federal and state agencies so that the responsibility is not lodged with the engineering profession as such. These possibilities are suggested as an explanation, but not as a justification, of our attitude.

Leadership urgently needed

Of course ASCE has not ignored appraisal and management problems or the need for engineers to take a substantial part in the direction of matters of policy. CIVIL ENGINEERING has given space to articles along these lines, but the effort has been spotty and seldom tied in closely to an immediate, specific problem. An exception occurred several years ago when the Society gave a prominent place in the convention at St. Louis to a report on the findings of the Hoover Commission regarding water resources development. This effort was timely and specific and could have resulted in a real contribution by ASCE. Unfortunately, however, it was done in such a way that it failed to produce an effective reaction from the profession, or to have any noticeable impact in the field of water resources development.

The need for the engineering profession to assume fully its responsibilities in this phase of engineering is becoming more urgent for a number of reasons. Two appear most obvious. One is that the full use of our water resources is becoming more complex and will continue to do so at a rapid pace. This is fundamental because the demands continue to grow while the available undeveloped resources shrink. Only a relatively few years ago, alternative solutions to water supply needs were readily available in many areas. The sequence of development was then of greatest importance. Now the multipurpose approach has come to be accepted but this is a tool, not an end, and the multiple demands are growing and shifting in importance with time. We are obviously faced with a situation that demands the fullest application of engineering talents in the conception of works as well as in their design and construction.

A vacuum will be filled by others

A second reason is simply that if our profession fails to accept the growing demands for its services, the vacuum will be filled by those who are less qualified. This is not to say that the job to be done is for engineers only. The contrary is true. The future solution of the demands on our water resources will require not only multipurpose development but also the skills and knowledge of many professions—an increasing number. But the engineering profession must not shrink from accepting its primary responsibility in the conception, planning, promotion, and management of works that are essentially of an engineering nature. The tendency to consider the

engineer's activity as limited to design and construction must be overcome—not by protest but by performance.

A start in the classroom

It seems clear that the engineering profession should make an organized effort to strengthen its performance. This effort could start in the engineering schools with greater emphasis on the significance of sound planning as an engineering job and on the basic principles essential to full project evaluation. In this connection, it was encouraging to learn recently that two of the prominent engineering schools in the Southeast will soon offer courses in resources development, emphasizing economic, legal, and social factors. The engineering societies, and ASCE in particular, should have a large part in fostering a joint effort by engineers. Publications and meetings can furnish the means to an understanding if the spotlight is held steadily enough on the problem.

Research on the whole problem

There is an opportunity for research on the whole problem of economic appraisal of resources development. Some federal agencies are doing work along this line, and a number of universities have programs aimed in this direction. I am not aware, however, of any major effort being undertaken by the engineering professions.

Within its membership ASCE has access to the wide variety of experience, knowledge, and ability necessary to conduct research in this field and might be able to organize to make effective contributions. However, it is not immediately evident that an engineering society such as ours can do the job through the usual channels. Committees are unwieldy devices at best, and a "representative committee" is apt to be even more so. Perhaps someone can devise a method for bringing the talents of ASCE to bear on this matter in a fully objective and creative manner. Profitable opportunities for study must be developed.

If progress through organized routes is not possible, we can only hope that those individuals most capable of fresh thinking will put their ideas in print for the stimulation of others. ASCE can provide a sounding board and perhaps serve as a catalyst. Somehow, the branches of our Society, individually and collectively, must take the lead.

(This article formed part of an address by Mr. Elliot at the ASCE Phoenix Convention, before the Water Resources Joint Session on "Multiple-Use Projects" of the Hydraulics, Power, and Waterways and Harbors Divisions.)

Hiding a sewage treatment plant in a park

GEORGE D. SIMPSON, M. ASCE, Associate

Havens and Emerson, Consulting Engineers, Cleveland, Ohio

Hiding a sewage treatment plant in a beautifully landscaped park can pose problems as challenging as the principal design requirements. The 18-mgd treatment facility recently completed in the City of Euclid, Ohio, is a good example. Connected with the design of these facilities were several unusual problems of an esthetic as well as a technical nature, which proved to be as interesting as the main consideration of providing safe and economical treatment of the sewage.

The City of Euclid is a suburb of Cleveland, with a present population of 63,000. It has owned and operated a sewage treatment plant, rated at 3.75 mgd, for over 30 years, built in what has since become Euclid Park. The treatment components consisted of screening, grit removal and primary sedimentation in an Imhoff-type tank, the chlorinated effluent and digested sludge being discharged to Lake Erie through a submerged outfall extending 1,500 ft from shore.

A tremendous population growth, coupled with 30 years of advances in treatment techniques, made this plant hopelessly overloaded and outdated. In 1955, recognizing the urgent need for replacement, the Euclid City Administration engaged the consulting engineering firm of Havens and Emerson to prepare plans for the construction of a modern sewage-treatment facility with an average capacity of 18.0 mgd. The modernized works, recently placed in operation, are designed to serve a connected population of 100,000 persons, including Euclid and the neighboring cities of Willowick and Wickliffe and limited areas of Richmond Heights and Highland Heights.

Treatment provided by the enlarged plant consists of screening, grit removal, comminution, chemical coagulation, flocculation, settling and chlorination. Sludge is digested in externally heated digesters, and dewatered on vacuum filters before incineration or drying. The treated effluent is discharged to Lake Erie through the submerged outfall, which has been lengthened and supplemented by the addition of a new outfall of 60-in. pipe. These are the basic features of the new plant, but they do not indicate the unusual aspects of the project, which had an important influence on the design.

Park developed around original plant

The first of these side issues concerned the site. The site of the original plant was between the city's main thoroughfare, Lake Shore Boulevard, and Lake Erie. All of Euclid's sanitary sewers were designed to flow to this site, which seemed ample in area and sufficiently isolated when the original plant was built there in 1927. Indeed, the treatment facilities occupied only a small part of the property, and forward-looking city officials were happy to have the remainder of the site for development as a park. Over the years, the park has been beautifully landscaped, with a fine layout of flower gardens, trees and shrubbery, and a modern community pavilion. This recreational area has attracted thousands of visitors each month.

Into this park setting, it was necessary to introduce structures that would enlarge the sewage treatment works sixfold. At first glance it appeared that such an expansion would inevitably destroy the recreational value of the park. However abandonment of the site for park purposes could not be tolerated since no other site suitable

At left, settling tanks are seen under construction near Euclid's Community Center in the city park. At right is the finished parking lot built over the tanks. Note proximity of high-class residential area at upper left.

for a park was available within the city. Nor could the treatment plant be located elsewhere since there was no suitable alternate site and the expense of sewer relocation or sewage pumping would be prohibitive.

Sludge pumped to another site

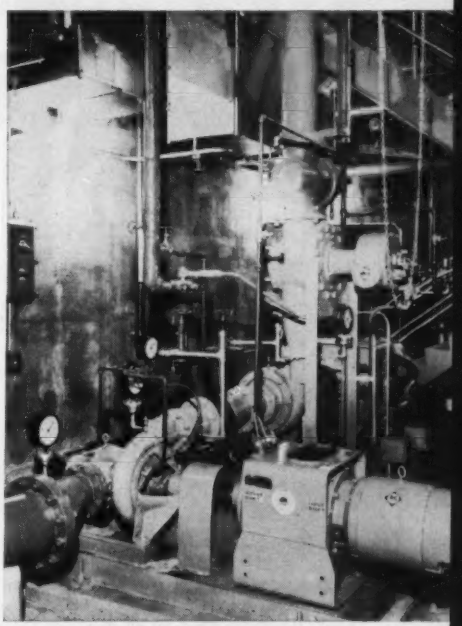
To resolve this problem it was decided, after extensive studies, to construct at the park site only those parts of the plant handling liquid sewage. All solids digestion, dewatering, incineration and ash disposal facilities would be constructed at a remote site. Sludge removed in the treatment plant in the park is pumped through an 8-in. cast-iron force main to a separate sluge-disposal works three miles away, near the municipal refuse incinerator.

This plan solved the dilemma of space limitations, but posed other problems. Obviously with the public visiting the park in large numbers, esthetics was an important consideration. It was essential that sewage, and the removed solids, be kept entirely out of the view of the public, and that odor control be of a high order of efficiency. These requirements were doubly important because the treatment plant adjoins completely developed residential property on three sides; actually, there are homes only 80 ft from the settling tanks.

Keeping the sewage out of sight was accomplished by building all treatment devices under cover or underground. Facilities for screening, grit removal, and chemical dosing are enclosed in the basement of an attractive administration building, with the ground floor devoted to office space, laboratory, and chemical and chlorine storage and feed equipment. The flocculation tanks were constructed by remodeling the original Imhoff-type settling tanks, and the original building which enclosed these tanks was completely renovated and modernized.

Parking area over settling tanks

Isolating the large primary settling tanks posed the biggest problem. These tanks are about 160 ft by 135 ft in plan—a rather formidable structure to hide. It was first proposed simply to cover the entire tank area with a concrete slab and fill over the slab with earth to provide a lawn and planting area. Then a plan was worked



One of two two-stage raw-sludge pumps, with hydraulic variable-speed transmissions, which pump raw sludge from the park site to the disposal plant three miles away.

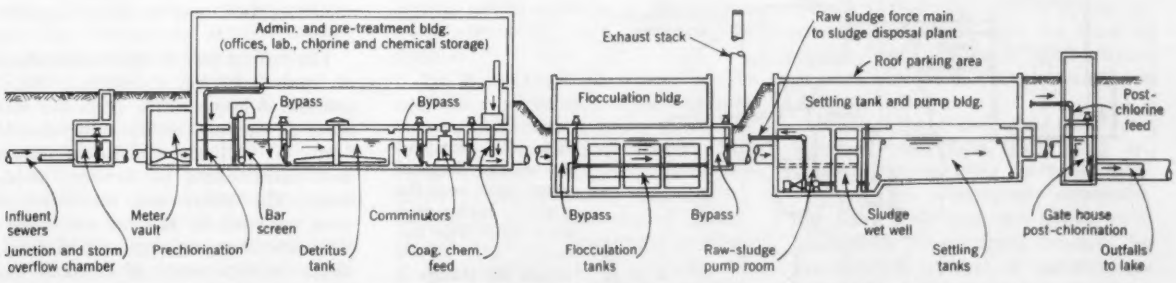
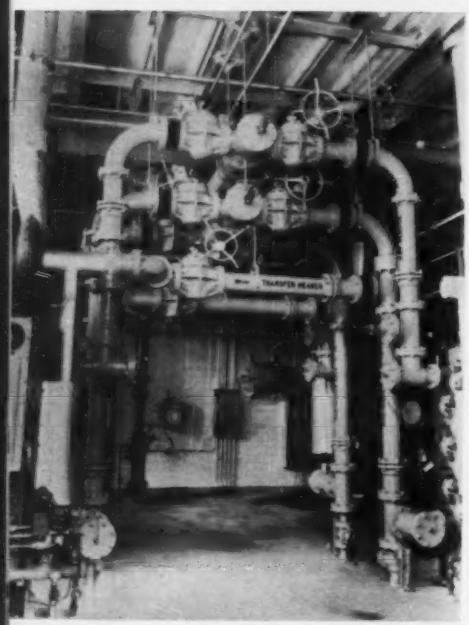


FIG. 1. Flow diagram for sewage treatment plant that keeps sight and smell of sewage out of Euclid's City Park.

The Flocculation Building with ventilating stack. The cars are on the settling-tank roof. In background is the Administration Building, which also houses screening, chemical storage and dosing facilities.

The sludge disposal plant is located three miles from the treatment works. The digesters and sludge heating and gas building are in the foreground, the sludge filter and incinerator building in the background.



Four sludge heaters are provided, having a total capacity of 2,500,000 Btu per hour. Normally fired by sludge gas, they shift automatically to burning oil if gas supply is insufficient.

out to raise the concrete roof slab of the settling tanks to an appropriate level, and to use the roof for a public parking lot.

This expedient entailed the cost of extending the tank walls and columns, and providing a slab especially designed to carry automotive loadings. It had the great advantage, however, of creating needed parking space without the loss of recreational space.

Odor control

The problem of odor control was attacked primarily by adding an extensive forced ventilation system. The original plant had included a gravity ventilating stack with an outlet about 75 ft above grade. This stack, which was destroyed by lightning during the construction period, was replaced by a new 80-ft chimney, which served as an exhaust outlet for the ventilating fans of the flocculation building and the settling tanks. This ventilating system has a maximum capacity of 40,000 cfm and may be operated at half speed when its maximum capacity is not required.

Under normal conditions, discharge of exhaust air at stack height effectively disperses any odors. In rare instances, however, an atmospheric inversion layer can bring exhaust air to ground level before complete dispersal of the odors. To handle this eventuality, a spray chlorination system was installed in the stack. Exhaust air passes thrugh a baffled part of the stack in which chlorine solution is sprayed into the air stream.

The smaller administration building is force ventilated to roof exhausts. Odor control in the form of facilities for prechlorination of the influent sewage is also provided to help prevent odors at the source.

With the main problems of "sight and smell" disposed of, there remained the question of attractive architectural treatment of plant structures and adequate landscaping. The old Imhoff tank building was modernized by removal of a roof monitor and lowering of a high parapet wall, as well as replacement of all windows and doors and a thorough job of masonry tuckpointing. New roadways and walks were provided, and the City Park Department has carried out a landscaping plan to restore the park to its original beauty.

In this brief article it has been possible to indicate only a few of the unusual features affecting the planning and design of this project. It may serve to illustrate, however, how non-technical considerations sometimes pose to engineers their most challenging problems.

The project was under the direction of Euclid's mayor, Kenneth J. Sims, and the Administrative Director, Michael A. Spino. The City Engineer is Leroy G. Williams, and Robert Henn is Superintendent of Sewage Treatment. The plans and specifications were prepared by Havens and Emerson, consulting engineers of Cleveland, under the supervision of Frank S. Palocsay, F. ASCE, partner.

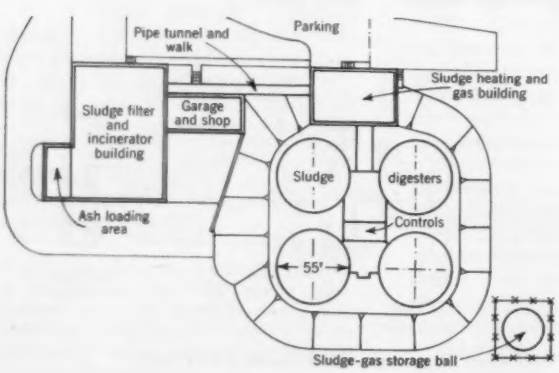
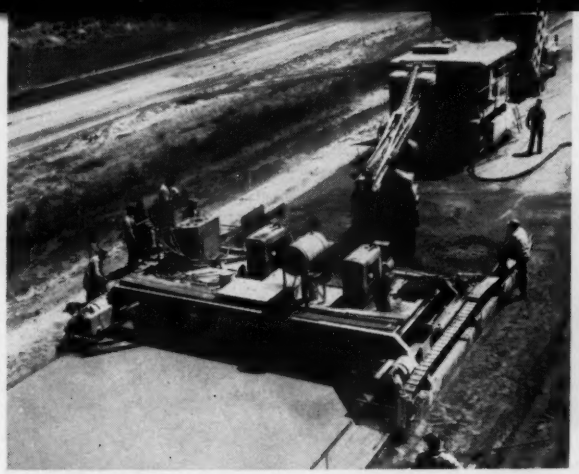
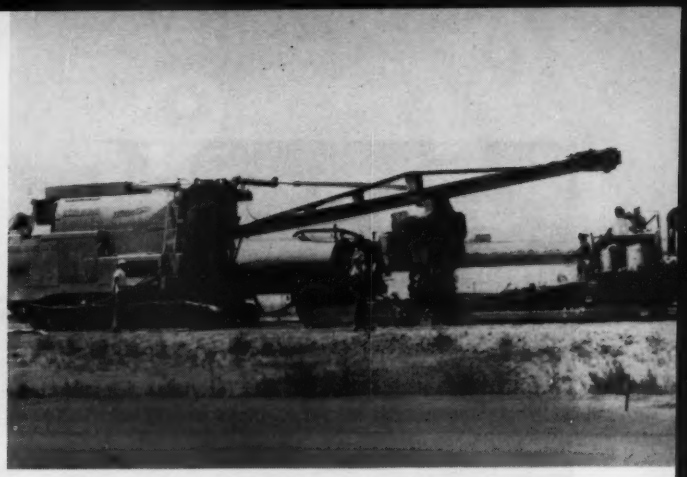


FIG. 2. Plan of the sludge disposal plant, built near the city's incinerator, three miles from Euclid's City Park where the sludge is treated.



Colorado's use of the slipform paver on Interstate projects has demonstrated that this method can produce smooth-riding concrete at substantial savings in construction cost.



A Koehring tri-batch mixer and Rex slipform paver were teamed up by the Gardner Construction Co., of Littleton, Colo., for a 15-mile Interstate job north of Denver.

End-result specification for concrete paving in Colorado

T. B. McPHERSON, M. ASCE, Statewide Paving Engineer, Portland Cement Association, Denver, Colo.

Since the introduction of the slipform paver in the summer of 1955, this type of equipment has been used to place a total of 258 miles of pavement 24 ft wide in Colorado. In this period the state has contracted for a total of 292 miles of such pavement, leaving the choice of placement method to the contractor. Of this total, more than 88 percent was done with the slipform paver, showing that the economies realized through its use are forcing a change in concrete paving methods.

Mark U. Watrous, veteran chief engineer for the Colorado Department of Highways, sums up the roadbuilding philosophy of the state in a few words: "In Colorado, we have an earnest policy against specifying methods and equipment to be used. We believe in asking for an end result and leaving the accomplishment to the ingenuity of the contractor."

This policy has produced some of the best road construction in the nation for Colorado motorists. A good example, and one pointed to with pride by the department of highways, is the result secured from pioneering work with the slipform paver.

While the slipform paver was used in Illinois and Iowa before it was used in Colorado, the two former states used it only for placing the base course for a bituminous surface and on secondary roads. Colorado is the first state to venture its use for a finished concrete surface on a primary highway and an Interstate project.

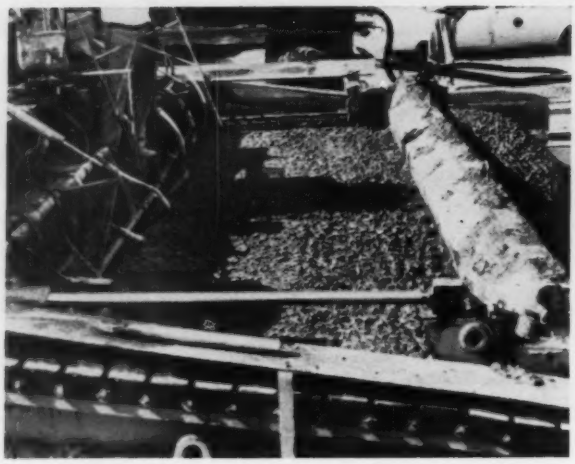
The first use in Colorado of the slipform paver was on a short project south of Greeley on U.S. 85 in 1955. Speaking of this project, W. J. Walsh, Staff Construction Engineer, said: "With completion of this project, we felt that reasonably satisfactory results had been obtained, and although there were a number of things to be desired during the construction phase, on account of inexperience in the use of this machine, we were encouraged to permit further use of this method of construction on contracts let during 1956 and 1957. We now believe we are getting results equal to or better than those obtained with conventional methods."

Mr. Walsh emphasizes "results." He notes that slipformed riding surfaces compare favorably with those obtained by conventional forms. Uniform vibration and tamping over the entire pavement width, and uniform compaction by compression of the machine's extrusion plate have resulted in a higher quality of concrete, the state believes. Mr. Walsh notes that concrete pavement placed in Colorado to date by the slipform method has no low spots or bleeding. There is no apparent settlement, an indication that concrete of high density is being obtained. Shrinkage appears to be uniform throughout each of the Colorado projects.

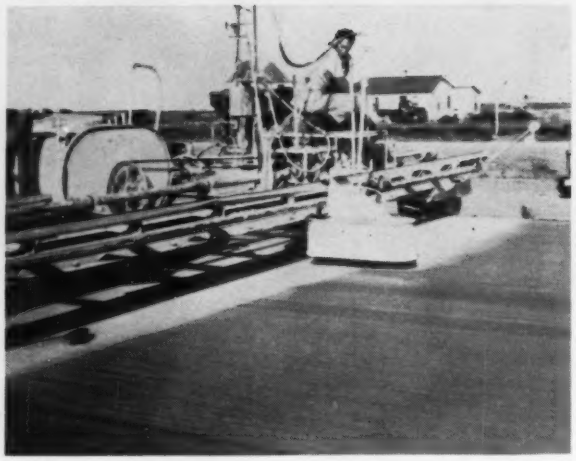
Evils of narrow specifications

The state highway department believes that specifications which bind the contractor too closely by stipulating exact methods of work and types of equipment could have a stagnating effect on progress in the roadbuilding industry. Equipment manufacturers like this approach as the time and money they put into improved machinery is not so likely to be wasted in overcoming the hurdle of stereotyped specifications. And of course the specification writer does not have to change specifications to keep abreast of each new development in methods or equipment.

It is significant that while other construction costs have been going up, the costs of concrete pavement construction has substantially decreased. See Table I. At each new letting more contractors bid on doing the work by the slipform method of construction. Currently under construction is a proj-



High-frequency vibrators immediately ahead of the slipform paver were used on the Gardner job to assure the densest possible mix for the paving machine.



To speed up and simplify curing, a spray unit that follows the slip form paver has been developed by Truelock Sawing and Sealing, Inc. It is manufactured by Heltzel Flex-Plane Co.

ect at the low figure of $3.13 per sq yd. This is considerably below the estimated cost for conventional construction.

New devices yield savings

The Gardner Construction Co. of Littleton, whose $2,091,301 paving contract involving 15 miles of Interstate Highway 25, north of Denver, was the third largest ever awarded by the Colorado Department of Highways, has recently illustrated the wisdom of Colorado's policy. Using the latest techniques, this firm performed one of the most rapid paving jobs ever carried out in Colorado. Before crews placed the concrete, they scarified the subgrade and recompacted it to obtain the greatest uniformity in moisture and density. The recently developed tri-batch mixer was used to supply a slipform paver with enough concrete for more than half a mile of highway a day.

The tri-batch mixer and slipform paver were not the only new devices employed by this company. An electronic weighing machine at a central batch plant assured uniform proportioning of truck-delivered cement and aggregates. Five-batch dump trucks serviced the mixer. All five batches from one truck sometimes were in the mixer at one time. The first batch was discharged to the bucket while three others were in the mixing compartments, and the fifth was on its way in the skip.

This mixer held 34 cu ft of mix in each of its three batch compartments, and a batch was ready every 29 sec. This represented a decrease in the discharge interval of about 13 sec from conventional dual-drum mixers. One man operated the machine. A high-frequency vibrator ahead of the paver provided the densest possible mix for the paving machine. The progressive techniques employed by this contractor were reflected in his low bid on this job—$3.17 per sq yd.

Contractors' ingenuity encouraged

The Colorado Highway Department has great faith in the ingenuity of contractors. In 1957, Western Paving Construction Co. of Denver and the Roberts Construction Co. of Lincoln, Nebr., submitted a combined bid of $1,016,154, the lowest of six, for concrete paving on 15.3 miles of U.S. Interstate 25, south of Denver. This work was for a two-lane, 24-ft roadway beside two existing lanes to provide a four-lane facility.

Expanding soils, however, had caused some distortion to sections of an old concrete roadway, and the Colorado Department and the U. S. Bureau of Public Roads agreed on special provisions, calling for four test sections to be incorporated in the project.

One of these experimental sections was described in part as follows:

"One mile of concrete pavement with welded wire fabric reinforcement. One half mile of this section to include style 6 x 12–¼ fabric with sawn joints spaced at 61.5-ft centers as presently specified in the plans. The other half mile to include welded wire fabric reinforcement, style 6 x 12-00/4 [0.3310-in. wires longitudinally, 6 in. on centers, with 0.2253-in. wires

TABLE I. Concrete paving costs for slab of 8-in. uniform thickness

From Colorado Department of Highways

Conventional				By Slipform		
Year	Project	Sq Yd	Cost per sq yd	Project	Sq Yd	Cost per sq yd
1955	Castle Rock north & south	117,570	$3.53	Wiggins-Ft. Morgan	122,390	$3.75
1956	.....	.....	....	Larkspur-Monument	172,340	$3.57
1957	Valley Highway (urban)	55,340	$4.12	Denver-Castle Rock	177,590	$3.45
1958	Valley Highway (urban)	88,840	$4.10	*West of Roggen, east	94,400	$3.80
				Adams City-Barr Lake	178,900	$3.23
1959	.....	.....	....	*Roggen, east and west	142,360	$3.85
1960	6th Ave., Sheridan & Wadsworth	24,230	$4.75	Hudson-Roggen	354,950	$3.25
				Lafayette Jct., north	408,290	$3.17
				Watkins-Strasburg	341,140	$3.35
1961	.....	.....	....	Walsenburg-Trinidad	261,560	$3.20
				S.H. 66-S.H. 56	194,140	$3.13

*On these projects cement was increased to 7 sacks per cu yd although Colorado specifications generally call for 6 sacks per cu yd. Also, joint spacing was reduced from the standard 20 ft to 15 ft because of the use of special local aggregate.

across, 12 in. on centers] with sawn joints spaced at 106.5-ft centers." The reinforcement was to be placed 2 in. below the surface of the 8-in. concrete slab.

The conventional method on this job, of course, would have been to place 6 in. of concrete, put the steel in position, and then place another layer of concrete, depending on vibration to cause the two layers of concrete to bond. However, the contractors had bid the job on the basis of using a slipform paver. This complicated the work, since the method requires that all concrete be placed in one pass.

To solve this problem the contractors developed a "sled," manufactured locally, to be attached to the front of the slipform paver to handle wire mesh. As the slipform was pulled down the highway by the mixer, the forward motion of the sled placed the mesh in the correct position. By this means the contractors were able to place an average of 1,650 ft a day of reinforced concrete roadway—another example of ingenuity unhampered by narrow specifications.

Currently four large concrete paving jobs are under way in Colorado; these will bring the total length of concrete on the Interstate system to 240 miles.

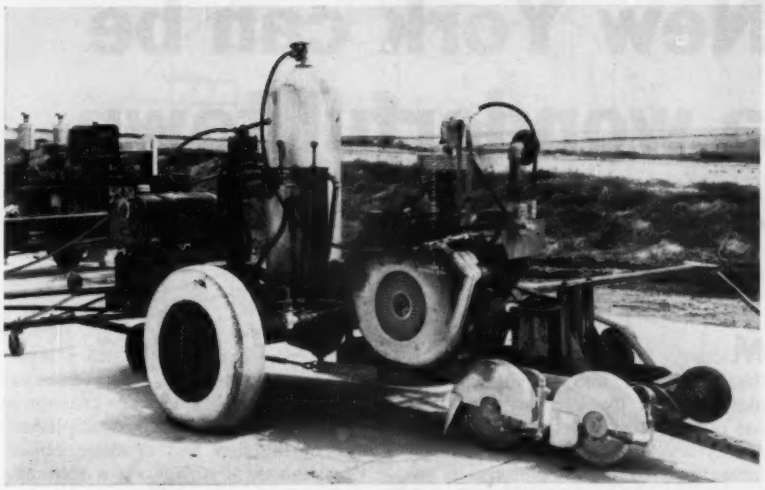
The Herren-Strong Construction Co. of Platteville was the lowest of 10 bidders on a project for the concrete paving of 14 miles of Interstate 25 north and south of Aguilar. The low bid was $1,460,234 for 10 miles of 24-ft highway and 4 miles of 48-ft width. The cost of this pavement is $3.20 per sq yd.

Contraction joints at an angle

The new highway will be the first in Colorado, and among the first in the nation, on which contraction joints will be sawed at an angle. The joints will angle 5 ft across the 24-ft width so that no two wheels of a vehicle will pass over a joint simultaneously.

Tobin Construction Co., of Kansas City, working between Hudson and Roggen on I-805, has introduced several innovations. For the first time in Colorado, a fine-grader mounted on treads similar to those of a slipform paver is being used to prepare the subbase. Ahead of this machine a conventional form grader was used to prepare the track. This helped speed up the grading operation to provide for the greater yardage possible with two pavers.

Peter Kiewit Sons Co. has started operations on 6.9 miles of four-lane paving on IS-25 between State Highway 66 and State Highway 56, north of Denver. This job will be the second in the state having joints sawed at an angle. Northwestern Engineering Co. is currently paving 13 miles of four-lane highway on I-70, using two 34E dual-drum pavers.



This propane-propelled self-aligning rig was developed by Truelock Sawing and Sealing, Inc., and manufactured by Con-Cut for sawing longitudinal joints on Colorado highway projects. Random cracking has been negligible.

Prime contractors are not the only ones using ingenuity to produce a better job at lower cost. On most of Colorado's slipform paving projects, Truelock Sawing and Sealing Inc. are subcontractors for the sawing, application of membrane for curing, and sealing. Using four-bladed, self-propelled saw units for cutting transverse joints, and self-aligning, single-blade units in pairs to cut longitudinal joints, this company has produced many miles of pavement sawing with very few random cracks. On one project, for instance, there were only three random cracks in 14 miles of four-lane pavement. Good equipment and careful supervision are responsible for this success.

To speed up and simplify the curing operation, Truelock improvised a full-width curing applicator mounted on rubber tires to travel in the slipform track. This new device is now being produced by Heltzel Flex-Plane Co.

All these projects are examples of the advantages of Colorado's forward-looking policy. As Mr. Walsh sums it up:

"We have no serious complaints up to this time, and, if we keep our feet on solid ground, the policy of end result as opposed to prescribed construction methods should work. Up to the present time and to the extent that we have gone, we find that it is working very well."

Colorado specification permitting use of slip-form paver

"Optional Placing, Spreading and Finishing Equipment:

"In lieu of the construction methods employing forms, spreading, consolidating, finishing and floating equipment described in preceding portions of this Specification, the Contractor may use a Slip-Form Paver.

"Slip-Form Pavers shall be equipped with vibratory and tamping bar assemblies which are effective over the full width of the surface. Any time that the forward movement of the paver is stopped, vibratory and tamping elements shall also be stopped.

"Where a Slip-Form Paver is employed, the Contractor will be required to provide a continuous deposit of concrete at the paver so that stopping and starting of the Slip-Form Paver will be at a minimum. The consistency of the concrete shall be such that its slump will not exceed 2 in.

"A subgrade machine or machines will be required to operate in front of the Slip-Form Paver. Equipment supplied must provide tracks and a subgrade for the paver which will ensure that the finished surface will be in conformity with the tolerances (for formed concrete: that is, ⅛ in. in 12 ft longitudinally, and transversely not more than ½ in. from the true template contour). This requirement recognizes that the pavement surface can be no smoother than the track area on which the paver operates. The subgrade shall be finished full width and to the elevation of the bottom of the pavement slab prior to the use of the paver so that no displacement of the foundation will occur through operation of the equipment.

"Where a Slip-Form Paver is employed, all reference in the preceding parts of this Specification referring to forms shall be considered to be non-applicable and procedures shall be adopted which will result in a satisfactory end product."

New York can be a wonderful town

HAROLD M. LEWIS, F. ASCE, Consulting Engineer and City Planner, New York, N.Y.

Midtown Manhattan, New York, is the recognized hub of the greatest metropolis in the Western World. It has outgrown its street plan laid down 150 years ago. Many city planners have discussed its problems and its potentialities; some have felt that it should be torn down and rebuilt. The Committee on Regional Plan of New York and Its Environs, in its final report, "The Building of the City," published in 1931, included in its midtown proposals redevelopment of waterfronts, new expressways, and a separation of pedestrian and vehicular traffic on the congested crosstown streets. Much has been accomplished toward the first two of these objectives; the third still awaits a solution.

Today New York is very planning conscious. New construction is booming in spite of the increasing congestion and the resulting high cost of doing business. Is congestion going to lead to stagnation? It is a good time to analyze how sound planning can help the strategic area of midtown Manhattan, considered here as the area from 14th Street to a few blocks north of Central Park (to include the intensive development that has spilled around the barrier presented by the park).

First, it is desirable to consider the planning or lack of planning during the three and one-half centuries of the city's existence.

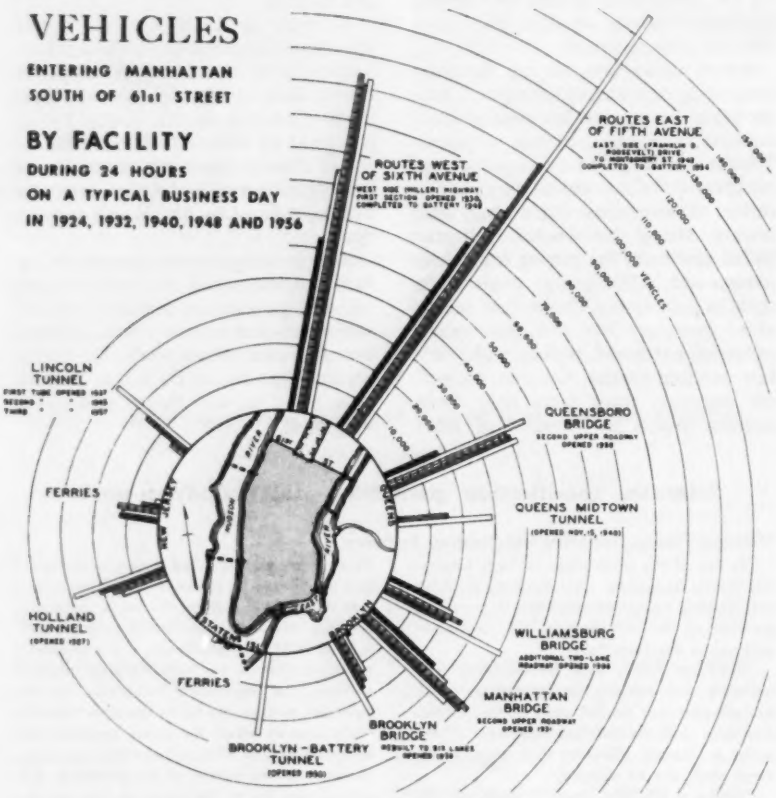
First 200 years—no planning

For its first 200 years New York (called New Amsterdam from 1614 to 1664) grew without a plan. Judge William Smith in his *History of New York from the First Discovery to the Year 1732* described it as then consisting "of about two thousand five hundred buildings. It is a mile in length, and not above half that in breadth. Such is its figure, its centre of business, and the situation of the houses, that the mean cartage from one part to another, does not exceed above one quarter of a mile, than which nothing can be more advantageous to a trading city."

By the end of this 200 years it had extended about two miles from the Battery to Houston Street; north of that point Manhattan Island was still in farms, with some scattered settlements along the East River and Hudson River waterfronts. Just before this time came a very important step for midtown Manhattan—the plan of 1811 prepared by a Commission of 1807.

This plan laid out the entire area from Houston to 155th Streets in a rectangular pattern, with only the Bowery and a portion of Broadway angling across. The plan stuck, with relatively minor additions and without such changes as would surely have resulted from periodic review by an official planning commission, if one had existed. Lexington and Madison Avenues and Central Park were added later. This Commission of 1807 ventured to look forward 100 years, stating somewhat apologetically:

"It may be a subject of merriment



FROM	NUMBER OF VEHICLES 1924	1932	1940	1948	1956
61st STREET	121,800	169,500	191,600	202,700	259,000
L.I. VIA QUEENS	18,000	46,400	39,600	55,700	71,000
L.I. VIA BROOKLYN	47,000	59,100	84,000	79,300	126,000
STATEN ISLAND	1,300	1,400	1,300	1,400	2,000
NEW JERSEY	11,900	26,500	34,700	42,900	61,000
TOTAL VEHICLES	200,000	292,900	351,200	382,000	519,000

FIG. 1. The number of vehicles entering Manhattan mounts steadily.

that the Commissioners have provided space for a greater population than is collected at any spot on this side of China."

The 1811 plan had obvious disadvantages: it did not provide enough public open space; diagonal thoroughfares were omitted; the topography was ignored; no adequate treatment of the waterfronts was provided. On the other hand, it did lay down a number of 100-ft thoroughfares and a planned street system, taking up 35 percent of the land area, in contrast with the narrow streets and disorganized pattern of the old city.

The third 100 years—early planning

During the next 100 years midtown Manhattan assumed much of its present form and became the hub of the city and its metropolitan area. With the establishment of Greater New York in 1898, the city crossed the Harlem River and absorbed The Bronx, crossed the East River and absorbed the old City of Brooklyn and the collection of towns and villages in present Queens, and crossed New York Harbor to absorb Staten Island. Central Park, acquired from 1856 to 1863, had provided a much needed breathing space and anchored midtown, keeping it from drifting further north and leaving blighted areas behind.

Still there was no real citywide planning, except such as was done by the Central Park Commission under powers given it in 1869, and transferred to the Department of Public Parks in 1871 with some additional jurisdiction.

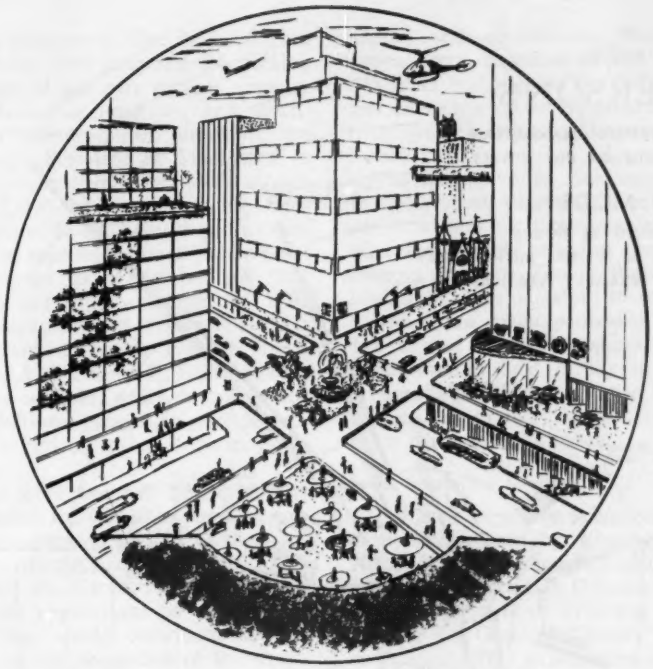
Since 1914—modern planning

At the beginning of the city's fourth century of life, city planning throughout the country was assuming a much broader scope and metropolitan regional planning was becoming a recognized procedure, largely sparked by the Burnham Plan of Chicago published in 1909.

It was in 1914 that George McAneny, then President of the Board of Aldermen, first interested the Board of Estimate and Apportionment of New York City in a city plan, but it was not until 24 years later, in 1938, that the city had its first official City Planning Commission established as a permanent part of the city government under its new charter.

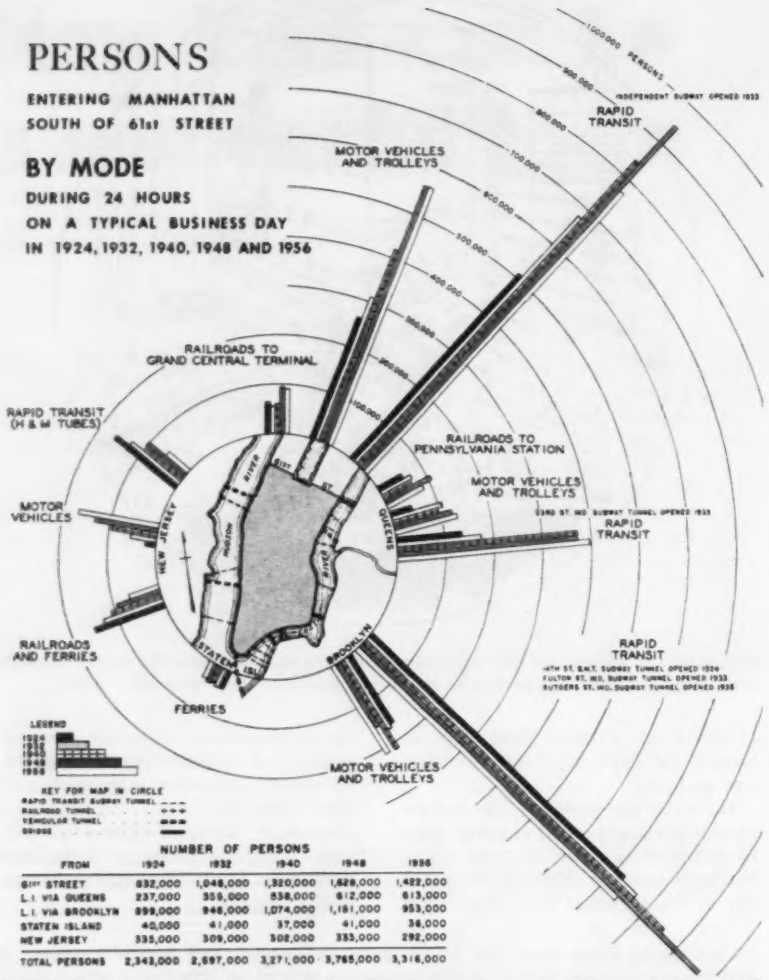
During that period there came, in succession: the city's pioneer Zoning Resolution (1916), the creation of the Port of New York Authority (1921), the Regional Plan of New York and Its Environs (1921-19931), and the comprehensive studies of Mayor LaGuardia's Committee on City Planning (1934-1936). Each of these steps increased the city's capability for effective planning.

By 1959 the necessity for governmental participation in regional planning, involving parts of three states, had been accepted. Through the initiative of the Regional Plan Association, the Metropolitan Regional Council, made up of official representatives under the chairmanship of the Mayor of New York City, was recognized as a permanent, top-level agency to consider all regional problems in the New York-New Jersey-Connecticut Metropolitan Region.



Separation of pedestrian and vehicular traffic by raising sidewalks to the second-story level has been suggested for many areas of New York and other cities.

Parked trucks block West 37th Street, between Seventh and Eighth Avenues, in Manhattan's garment district. Similar conditions prevail on 39th Street, where ASCE Headquarters was located until this month. Photo courtesy Edwards and Kelcey.



FROM	1924	1932	1940	1948	1956
61ST STREET	832,000	1,048,000	1,320,000	1,628,000	1,422,000
L.I. VIA QUEENS	237,000	358,000	538,000	612,000	613,000
L.I. VIA BROOKLYN	899,000	948,000	1,074,000	1,181,000	953,000
STATEN ISLAND	40,000	41,000	37,000	41,000	36,000
NEW JERSEY	335,000	309,000	302,000	353,000	292,000
TOTAL PERSONS	2,343,000	2,697,000	3,271,000	3,765,000	3,316,000

FIG. 2. The number of persons entering Manhattan has passed its peak, but rapid transit remains the principal means of travel.

The urgent need of doing something about southern Manhattan, and particularly of providing adequate vehicular and passenger circulation to relieve the present intolerable congestion is shown in Figs. 1 and 2. The growth in the number of vehicles entering Manhattan south of 61st Street on a typical business day from 1924 to 1956 is shown graphically and statistically in Fig. 1. An analysis by 8-year periods of the movement from the various sectors of a circle drawn around the area, and notations of the improvements in highway facilities affecting the trends, are indicated. During these 24 years the number of vehicles multiplied 2.6 times.

A similar analysis of the number of persons entering the same area over the same period is given in Fig. 2. Here a more varied trend is shown, with the railroads losing passengers to motor vehicles. The year 1948 showed the peak travel of 3,765,000 persons entering daily. Since then increased decentralization has resulted in a decline, but the 1956 count of 3,316,000 persons is still a staggering figure and 1.4 times that in 1924.

How can planning help?

The value of both city and regional planning is now widely accepted in the region. Looking particularly at southern Manhattan, six procedures appear to the writer to offer great promise.

Revised zoning. On December 15, 1961, a revised Zoning Resolution will go into effect—the first major revision of New York's original zoning of 1916. It was unanimously adopted by the Board of Estimate on December 15, 1960, after efforts extending over twelve years. A year of grace was allowed during which building plans might be filed under either the old or the new regulations.

The new zoning will provide a much greater control over building bulk in midtown Manhattan, as well as in other parts of the city, and through the new zoning map will assure an improved pattern of land use. Sound administration and a determination to hold the line against unjustified amendments are essential parts of future policy.

Most of the credit for getting the necessary public and private support for the new Resolution rightfully goes to James Felt, Chairman of the City Planning Commission. Typical of support in the public press are the following editorial comments:

"And let's have no nonsense about delaying to study some more. The time for action is now." (*New York Times*, September 12, 1960)

"No subject in our municipal history, not even a new city charter, has undergone more extensive examination and debate . . . Let's get on with adopting the new law that will accelerate New York's progress." (*New York Herald Tribune*, October 17, 1960)

Improved street pattern. Any change in the street pattern of midtown Manhattan will be difficult and costly because of the existing intensive development. Therefore the old plan of 1811 will continue its firm grip on this area. The two waterfront expressways—one completed along the Hudson River in 1948 and the other along the East River in 1954—have been lifesavers for north-south movement. There has been no equivalent facility for crosstown movement. The one major midtown addition of this type that now seems possible is a crosstown expressway in the vicinity of 34th Street, originally proposed as a tunnel under 38th street to connect the Lincoln and Queens Midtown Tunnels. The latest proposal is an elevated expressway in the vicinity of 30th Street also to connect, but less directly, with the same two river tunnels.

In several cities proposals are being made as parts of local redevelopment projects for some separation of automobile and pedestrian traffic by raising the pedestrian traffic to the first-story level, with crossings above street level. Such a treatment, with second-story pedestrian arcades, was suggested many years ago for parts of midtown Manhattan by an architect's committee of the New York Regional Plan under the chairmanship of Harvey Wiley Corbett. This proposal was described in the final volume of the Regional Plan of New York and Its Environs (*The Building of the City*, 1931, pages 308-309) as follows:

"We see a city with sidewalks, arcaded *within the building lines*, and one story above the present street grade. We see bridges at all corners,

the width of the arcades and with solid railings. We see the smaller parks of the city (of which we trust there will be many more than at present) raised to this same sidewalk-arcade level (public parking space for autos being provided underneath) and the whole aspect becomes that of a very modernized Venice, a city of arcades, plazas and bridges, with canals for streets, only the canal will not be filled with water but with freely flowing motor traffic, the sun glittering on the black tops of the cars and the buildings reflecting in this waving flood of rapidly rolling vehicles."

Control of moving and parked cars. At times some midtown streets resemble long, narrow parking lots—not modern lots with aisles permitting any car to be moved out freely, but those where the operators fill up both berths and aisles and have to shift a half dozen cars in order to get out one. There are police regulations to control both moving and parked vehicles but long lack of enforcement has now made it almost impossible. An occasional fine is preferred to the inconvenience of obeying the law. Special-privilege parking by drivers of public vehicles, doctors, "emergency" repair men, and others is being abused.

Crosstown "express" streets

A suggested method to improve this situation is to designate several pairs of one-way "express" crosstown streets in the midtown area, with roadways widened to 40 ft where possible (otherwise to 36 ft), on which there would be no daytime parking and, during rush hours, no truck loading and unloading and no taxi stands. The Regional Plan Association suggested, in a 1940 report, that such routes should run from Third to Ninth Avenues. With the present system of one-way avenues, they should probably extend from Second to Tenth Avenues in order to be effective.

Offstreet parking. More offstreet parking facilities are needed. There are two main approaches to this problem: (1) strengthening the requirements for compulsory on-site parking for new construction through zoning; and (2) construction of municipal parking garages on the fringes of retail and office centers, catering primarily to short-time parkers. The first of these will be accomplished by the new Zoning Resolution already referred to. This will require parking spaces in residence districts varying from 40 to 100 percent of the number of dwelling units, according to the type of district.

The second approach has had a difficult road and is now a matter of some controversy. The Regional Plan study of 1940 proposed 24 parking garages of not over 400-car capacity in Manhattan (midtown and downtown) and downtown Brooklyn; the Borough President of Manhattan in 1945 recommended six 400-car and two 1,000-car garages in the midtown area. In 1957 the Planning Commission approved a small public parking garage which was built at 53rd Street and Eighth Avenue. In 1960 the Department of Traffic released a Midtown Manhattan Parking Study, prepared by Charles E. DeLeuw, consclting engineer, which recommended 16 additional garages to provide over 10,000 parking spaces in the midtown area.

The Department of Traffic recently applied to the City Planning Commision for approval of four of these garages. After public hearings the Commission on March 15, 1961, denied all four applications on the grounds that they would contribute substantially to the congestion of the streets to which they would have access, that they would not be the best land use for such property (which is in great demand for offices and commercial uses), that it is inadvisable to attract more motor vehicles into the area, and that improved mass transit is the only real solution for bringing people into midtown. It was stated that the Commission might approve garages "of appropriate size in suitable locations where they will not contribute to excessive congestion."

While the writer agrees that office workers and other employees should not be encouraged to bring their cars into midtown Manhattan for all-day parking, he believes there is a legitimate need for short-time parking in the midtown area by those whose business can best be transacted by private automobile and that such people should be able to find offstreet parking within convenient reach of their destinations. It appears that this can only be done by a system of public parking garages.

Offstreet loading and unloading. The practice of using the curbs of the public streets as loading docks for boxcar-type trucks and tractor-trailers, and the sidewalks as loading platforms, has become so serious in the garment and wholesale sections of midtown Manhattan that some other solution must be found. It is common practice for trucks to park for hours waiting for an opportunity to pick up their loads. Traffic is literally brought to a standstill (see photo on page 41).

In 1940 requirements were added to the Zoning Resolution for loading berths for new construction, enlargements, and conversions. This has proved very beneficial in the many new office buildings but has had no effect on such areas as the garment district, which is using buildings erected before 1940.

The Regional Plan Association, in its 1940 report, suggested some retroactive features for these requirements after a reasonable period of time, but even in the new Zoning Resolution loading facilities accessory to existing buildings are made permissive only. The answer therefore appears to be some form of joint facility to serve groups of buildings, an entire block, or even two or more blocks, through some other action program.

Truck berths for loading

The latest suggestion is embodied in a report prepared by Edwards and Kelcey, Engineers and Consultants for the New York City Department of Traffic ("A Study of Trucking Problems in the Garment District," February 1961). They studied sites on two blocks in the garment district. The plans developed showed provisions of 7, 8, or 9 truck berths for vehicles handling piece goods at each site and it was estimated that loading operations could be handled in 15 minutes. Movement of goods between the joint facility and the separate establishments would be via the type of hand carts now in common use within the area, and ample space for storage of full and empty carts is provided at each site. It is hoped that the now wasted standing time of such trucks on the city's streets can be eliminated.

Certainly all possible methods of providing such facilities—by private initiative, by public dictum, or as public facilities—should be thoroughly explored.

Suburban rapid transit. A comprehensive suburban rapid-transit system to restore mass transit on a regional basis is the primary requirement to prevent death by strangulation from the ever-rising street congestion of not only midtown but other main centers of New York. Here regional, state, and probably federal, cooperation is essential.

Many plans have been made over the past 40 years but all have foundered through the lack of a practical method of financing. The threat of the railroad companies to abandon their commuter service hangs over the area, but this should not be allowed to happen. Now that the governors of the three states involved, the Port of New York Authority, the City of New York, and at last, the Federal Government, are all actively interested, there seems some hope of a solution.

A new concept for technical programs in ASCE

WILLIAM H. WISELY, Executive Secretary ASCE

When an engineering society of 48,000 members attracts only 5 to 10 percent of them to its national technical meetings each year there is obviously cause for concern. This condition has prevailed in ASCE for some years. At the same time cognate civil engineering organizations—mostly "splinters" from ASCE—are holding larger and better technical meetings and producing superior publications. Some examples are the American Concrete Institute, the American Water Works Association, the Water Pollution Control Federation, the Highway Research Board, and the American Railway Engineering Association.

Critical appraisal of this problem reveals quickly that there are serious deficiencies in the present pattern of the Society's technical meeting programs.

PRESENT TECHNICAL MEETINGS

The principal technical meeting programs of the Society traditionally have been presented in its Conventions, of which there are usually three annually. In recent years there has been an increasing trend to additional specialty conferences, sponsored and presented by a single Technical Division. There have also been occasional joint conferences with other national engineering societies, such as the Nuclear Congress and the American Power Conference.

Conventions

All of the fourteen Technical Divisions of the Society are free now to arrange sessions in any Convention program. This results in a haphazard assembly of 35 to 55 sessions offered by 10 to 14 of the Divisions in concurrent batches of as many as seven sessions in any morning or afternoon period. There is seldom any consistent aim or direction to the program as a whole; it is too often a conglomerate of sessions and papers that is arranged merely because a convention is scheduled for a particular time and place.

Some observations on present Conventions:

1. Sessions arranged by any Division are rarely strong enough to draw a truly national audience. Except for officers, staff, and committee personnel, whose expense is borne entirely or in part by ASCE, the attendance is mainly regional and local.

2. The program in any Technical Division specialty is rarely strong enough to justify granting of time and expenses by employers of members. The bulk of attendance from outside the Convention locality is limited to self-employed and supervisory personnel. Registration by younger employee members is practically all local.

3. Session attendance is small, usually ranging from 20 to 100. This discourages top-flight authors and papers. Society publications subsequently suffer.

4. Program coverage of professional topics is only nominally effective because the audience is small and includes many of the same people at all Conventions. The impact of professional activities is realized effectively only when there is a national audience representing a cross section of all segments of membership.

5. The demand for meeting rooms to accommodate numerous concurrent technical sessions greatly complicates Convention management and limits the selection of Convention headquarters.

Technical Conferences

Because the Conventions have not given adequate opportunity for exchange of knowledge and experience, the more aggressive Technical Divisions have staged periodic or occasional conferences of their own. Such conferences are considered to be the most productive technical meetings of the Society at this time.

These conferences are sponsored and presented by a single Technical Division, with the cooperation of a Local Section. They may offer a general program under the interest of the Division, such as the Annual Hydraulics Division Conference, or a specialty program, such as the Electronic Computation Conferences that have been held by the Structural Division.

As managed to date, however, these conferences have also been more regional than national in attendance. Also, a topic such as "Electronic Computation" is of interest to practically all members and should be offered through all the Divisions concerned.

In each of the years 1959 and 1960, there were six Technical Division conferences, drawing an aggregate registration of 1,300 members.

Joint Conferences with Other Societies

ASCE has always been a willing participant in joint programs with other engineering societies. Joint programs in Society Conventions have also been arranged, as with the American Concrete Institute in February 1958, and with the International Association of Bridges and Structural Engineering in October 1958.

The joint conferences (the American Power Conference, the EJC Nuclear Congress, the Engineering Management Conference) do not, however, attract a significant segment of the ASCE membership.

PROPOSED PLAN OF MEETINGS

No doubt there is more than one possible solution to the problem as outlined. The plan suggested here is believed to be flexible and adaptable to the development of programs with a definite and specific purpose.

The components of the plan are:

1. At least four annual basic technical conferences centered upon major areas of civil engineering practice.

2. Annual or periodic Division or specialty conferences on timely subjects.

3. One Annual Meeting of broad civil engineering interest, to be held in connection with one of the basic technical conferences.

4. Joint technical conferences with other societies.

Basic Annual Technical Conferences

As presently visualized these would be: (*a*) the Annual ASCE Environmental Engineering Conference, (*b*) the Annual ASCE Structural Engineering Conference, (*c*) the Annual ASCE Transportation Engineering Conference, and (*d*) the Annual ASCE Water Resources Engineering Conference. Sponsorship and participation in them would include only those Technical Divisions having a direct interest in the scope of the conference, somewhat as follows:

TRANSPORTATION ENGINEERING CONFERENCE	ENVIRONMENTAL ENGINEERING CONFERENCE
Highway	City Planning
Air Transport	Sanitary
Waterways and Harbors	
City Planning	
Pipeline	
STRUCTURAL ENGINEERING CONFERENCE	**WATER RESOURCES ENGINEERING CONFERENCE**
Structural	Power
Engineering Mechanics	Sanitary
Soil Mechanics and Foundations	Hydraulic
	Waterways and Harbors
	Irrigation and Drainage

In this schedule of assignments

• There is much concern with various indications that civil engineering is declining in stature among other engineering disciplines, particularly as measured by college enrollments. At the same time, population growth, a burgeoning economy, increasing defense needs, and the onset of the Space and Nuclear Ages impose new and greater demands and challenges upon the civil engineer.

It is vitally important, therefore, that every resource be fully utilized to develop civil engineering as a science and art. There is currently much discussion of current needs in education and research, but little thought has been given to the greatest resource of all—the 100,000 civil engineers who are in practice today.

The memorandum presented on these pages outlines a plan that will employ to best advantage the manpower, facilities, and mechanism of ASCE in meeting its responsibilities in modern technology.

This proposal has already been endorsed in principle by the Executive Committee of the Board of Direction, the Committee on Technical Procedures, the Committee on Division Activities, the Committee on Conditions of Practice, and the Committee on Convention Policy and Practice. The Executive Committee has authorized publication of the proposal in "Civil Engineering" in advance of the Board of Direction meeting in October when the plan will be considered for formal adoption. W.H.W.

twelve of the fourteen Technical Divisions are included. The Surveying and Mapping Division and the Construction Division, being independently functional, could provide papers in any of these programs under the conference theme.

Whenever appropriate, luncheon addresses, papers, or forums dealing with professional subjects and activities would be included in any technical conference.

Locale of the basic conferences would be rotated throughout the nation. Meetings of the Board of Direction could also be rotated among them as desired.

Specialty Conferences

There will always be a need for technical conferences pointed to specific timely problems and subjects. These should be sponsored by one or more Technical Divisions, on the basis of direct interest, and they should be presented as major national meetings, supplementing the basic annual conferences.

Some Divisions, such as Surveying and Mapping, Construction, and Engineering Mechanics, might occasionally find it expedient to stage their own specialty conferences. In fact, any Division would be free to hold a technical conference for its members whenever there is such a need.

Annual Meeting

The Annual Meeting would be planned for all members of the Society, regardless of technical specialty. It would always be held with one of the major technical conferences, preferably alternating among them. Duration would be one to two days, in addition to the time for the concurrent technical conference.

Features of the Annual Meeting would be:

1. Annual Business Meeting.
2. Annual Honors and Awards Convocation.
3. Addresses by national figures from government, industry, and other professions, on topics of timely public concern (such as the Interstate Highway Program, national defense, nuclear energy applications, space age developments, international relations and projects, etc.)
4. Conditions of Practice programs, on professional subjects in all areas.
5. Special addresses by Society officers (President, President-elect).
6. Special lectures by national and international authorities.
7. Workshop sessions for Committee on Conditions of Practice and Committee on Technical Procedure.

It will be noted that this type of program possesses extraordinary public relations possibilities.

Joint Conferences with Other Societies

Opportunity for joint programs with other societies should be greatly enhanced in the proposed basic annual conferences. The American Railway Engineering Association, the American Association of State Highway Officials, the American Road Builders Association, and the Highway Research Board would be logical participants, for example, in the Annual ASCE Transportation Engineering Conference.

Increased emphasis on the Division and specialty conferences as national meetings would make these more attractive to cognate and related societies for joint participation.

CONCLUSIONS

It is believed that the proposed new combination of technical programs will markedly enhance the over-all quality and productiveness of the meetings, and publications, of the Society. Among the foremost benefits and advantages are the following:

1. All meetings would have specific direction and purpose, offering vigorous programs with national and international appeal and providing maximum advantage in personal contacts.
2. Better audiences would attract the best available authors and papers, with ultimate secondary benefit to all Society publications.
3. Strong, four-day, concentrated programs would encourage subsidization of time and expenses of employee members, broadening the service to membership.
4. Opportunity would be afforded for cross-fertilization of ideas and practice among those Technical Divisions having overlapping and related interests.
5. There would be at least one meeting a year that any member of the Society "could not afford to miss." Just one of the basic annual conferences would give a member of any of the participating technical divisions as much or more useful material as all three of the present conventions.
6. By attracting more members from all segments of interest and age, the proposed technical conferences and Annual Meeting would afford a much broader audience for Conditions of Practice programs.
7. The proposed Annual Meeting would give greater emphasis to professional activities, public affairs, and to honors and awards, with maximum opportunity for public relations development.

Technical tedium—or otherwise

ROY W. CRUM, M. ASCE

In the presentation of technical papers, the salutation, "Mr. Chairman, ladies and gentlemen—" is too often "the opening gun in a long and boring engagement, testing the perseverance of the speaker against the endurance of his audience." So stated the introduction to the following essay by Roy W. Crum when it was printed in CIVIL ENGINEERING *for July 1946, (vol. p. 318). This second printing in* CIVIL ENGINEERING *is at the request of several members who would like all potential speakers to read and heed it. Roy W. Crum, the author, was a man of many accomplishments. A former ASCE Director, he was head of the Highway Research Board of the National Research Council in Washington, D.C., at the time of his death in 1951.*

At last your time has come; after hours of waiting through the interminable and boring speeches of your fellow conferees the chairman is about to call upon you. He announces your paper; you rise and, accompanied by a scattering of perfunctory applause, walk briskly to the platform, only stumbling on the top step and getting your feet tangled in the wires strewn around the floor for the loud speaker apparatus.

"Mr. Chairman, ladies, and gentlemen," you say, and reach in your inside coat pocket for the paper. Consternation reigns for a moment when you find it isn't there, but you have not quite lost all of your presence of mind yet and remember that you put it in your left-hand outside coat pocket. Fishing it out, you are ready to go ahead after first disburdening yourself of the few ill-chosen introductory words that you have been mulling over the past hour and a half.

Your labored joke doesn't get much of a laugh but you are too flustered to bother about that. Grasping your bulky manuscript firmly but shakily in both hands and carefully avoiding the "mike," if there be one, you start to read. After reading one page you are somewhat appalled by the magnitude of the remaining task. You wonder momentarily if you are going to be able to get through in the allotted twenty minutes. But you haven't time to worry about that now and anyway time alone will tell. Gluing your eyes to the page you proceed. About this time some ill-mannered person in the rear of the room calls "louder." Rather resentfully you raise your voice for a few lines, but you can't think of that and keep your place at the same time so your voice soon fades down to your usual tone and thenceforward you pay no attention to such unwarranted distractions.

By this time you have recovered some of your self-confidence and most of the shakiness is gone and you are forging ahead full steam. But you don't dare glance at the audience or it will return and you will lose your place. On and on you go without thought of time. By and by you become aware that the chairman is trying to convey some sort of signal to you, but you can't take on his troubles too, and you keep on reading till you realize that you have come to that welcome period when you can show the pictures.

Saying, "I have some lantern slides that I would like to show if there is time." You start a search for the push button that will signal the operator, finding it, after some confusion, grasped firmly in your right hand.

The first slide comes on and, turning your back to the audience, you rather confidentially tell the screen what the picture is about. This takes some time as it is a complicated table with lots of data. This part of the speech doesn't take over a half hour as there are only about a dozen of the slides crammed with tabulated data and intricate curves. In doing this you repeat practically everything you read before the picture came on.

As the lights return you notice that the chairman is about to have apoplexy and there is a red light shining on the reading desk in front of you, but the whole point will be lost unless you read your conclusions and so you struggle on manfully to the bitter end.

At last there is no more to read. You say "I thank you" and stagger from the platform with the beginning of a mild inner glow that says to you "well done." This feeling is heightened by the applause which is louder this time, indicating that the audience's feeling of relief that you are through is slightly greater than its courtesy in giving you a hand when you started. To tell the truth, no one has listened for the last 45 minutes.

The chairman is now saying, "I am sorry that on account of the fact that we are way behind our schedule it will be necessary to defer the discussion of this interesting paper and proceed to the next item on the program."

You think, resentfully, that if the speakers before you hadn't taken so much time there might have been some interesting discussion of your absorbing topic. But you are too overwhelmed with relief at having the thing done to cherish that feeling long and settle down on the end of your spine to enjoy the next paper in a rather comatose condition.

But instead of being soothed by a gentle flow of monotone as you expect, something seems to be happening; your lethargy is being dispelled; the man on the platform is talking in such a way that you are becoming interested in spite of yourself. He is reading from a manuscript but from the way he is holding it you can tell it isn't very long. And he seems to know what he is saying so well that he can look up and actually talk to the audience most of the time.

It doesn't take him very long to tell what the paper is about and why and then he jumps right over the tedious details of what he did, which took so much time in your paper, and goes on to tell what he found out. Soon he comes to a place where some illustration is indicated. Without pausing in his stride he signals the operator and a slide comes on the screen; just a simple little table that anyone can grasp at a glance but full of significance. Glancing over his shoulder to make sure the picture is the right one, the speaker describes it quickly and goes on to the next thought in his paper. Presently he comes to the next slide. This time it is a diagram; just a single curve, but illustrating a telling point forcefully and without loss of time.

Well, time has been getting on and the chairman even in this case signals the speaker that his time is about up. Strangely, this doesn't seem to disconcert him; he just goes for the last sheet of the manuscript, reads it quickly and makes a graceful exit. Too good to be true—for a burst of appreciative applause wakes you up and you realize that at least part of this remarkable performance has been the figment of a dream, but the man has done a good job and got through almost on time. Maybe he took the secretary's letter of instructions seriously.

Musing on this while sticking out the rest of the program you think, "I wish I could present a paper like that"

and later, being a person reasonably quick on the intake and still having plenty of self-confidence you say to yourself, says you, "By heck, I can do a job like that." And so being a confirmed convention hound and a man of experience and ideas besides having opportunities to write technical papers, you make yourself over into a forceful and interesting speaker by means of a few simple principles based upon your illuminating flash of insight while drowsing through a dreary session.

1. You realize that most technical papers have to be long enough to cover the subject thoroughly with supporting data to satisfy the studious reader who will ultimately use your material, but you also realize that there is no need to present all this orally and that no one would get it even if you did. No one can get the good out of a technical paper by reading it just once. Many passages must be read and reread and reread and studied, so why should you expect anyone to grasp it all instantly while you read it to him? Better just read him the significant parts that he can assimilate as you go along.

2. It is apparent therefore that the first thing to do is to prepare a condensed version of the paper that can be read in the allotted time. Twenty minutes is about right, although some gifted persons can hold an audience with a dry subject for thirty.

In this version, tell what you did and why you did it and then jump right over the dreary details of how you did it and tell about what you found out that is new and interesting.

3. Having written the condensed version, read it aloud for timing. Then rewrite it so that the time will just be nicely filled. Then rehearse it—to your wife, or secretary, or the mirror until you can deliver it with some degree of animation and direct appeal to the audience. (It sometimes helps to pick out someone who looks as if he agrees with you and aim many of your remarks at him. His nods will spur you on, or else pick out a dumb-looking one and see if you can wake him up.)

4. But let's not forget the slides. If well done they can add greatly to the quick comprehension of a technical talk. Just remember to express only one idea on a slide and make it so simple that about all you need to do is name it. It is best to use the slides to illustrate points as you go along. If left to be shown all together at the end there is a great tendency to waste time repeating what has already been said.

5. Sometimes you do miscalculate and the chairman calls time on you before you are quite through. Why not provide in advance for this contingency and if it arrives, just turn to the closing statement you have already prepared, read it and stop?

6. After you have prepared and delivered a few papers in this way you will probably discover for yourself that there is an even better way. Go ahead and write the short version, then write an outline of it, then memorize the outline and soak yourself in your subject till you don't need a manuscript. Just talk and follow the outline in the back of your head. Of course it is a good idea to have a copy of the outline on small cards in your pocket in case of emergency. You are not likely to need it but if you do, it will save the day. Doing it this way it is also easy to go too long and bring the chairman's warning down on you, so have that prepared closure all ready to grab and read if you haven't had time to memorize it.

7. This is not intended for a discourse on technical writing, but one principle should be mentioned that is of particular importance in preparing a short paper for oral presentation.

Write simply, using short common-usage words and as few of them as possible.

For instance, to say: "When concrete is being placed during cold weather and the air temperatures may be expected to drop below 35 degrees Fahrenheit, a sufficient supply of straw, hay, grass or other suitable blanketing material shall be provided along the line of the work and any time when the air temperature is expected to reach the freezing point during the day or night, the material so provided shall be spread over the pavement to a depth to prevent freezing of the concrete before it has thoroughly hardened," may be perfectly good specification writing, but if you want to make the point in a speech why not say: "During freezing weather freshly laid concrete pavement should be protected by a suitable insulating layer."

On reading this thing over, it doesn't seem so difficult; I don't think one needs to be an expert to follow these rules. I think I will try it myself some day.

Editor's Note: ASCE has a pamphlet on the subject, "So You're Going to Present a Paper." A postcard request to the Executive Secretary will bring you a copy. Remember our new address: United Engineering Center, 345 East 47th Street, New York 17, N.Y.

EJC to Sponsor 1962 Nuclear Congress

Public aspects of the use of nuclear energy, as well as engineering and operational problems within the nuclear industry, will be highlighted in the technical sessions of the 1962 Nuclear Congress and Atomic Exposition. Announcement of congress plans comes from Lombard Squires, of the E. I. du Pont de Nemours & Co., Inc., general chairman of the event, which will be held in the New York Coliseum, June 4-6, 1962, under sponsorship of Engineers Joint Council.

Program Committee Chairman J. C. Woodhouse, of the E. I. du Pont de Nemours & Co., announces that the technical sessions are being specially planned to meet the needs of all engineers engaged in the nuclear field. They will cover the following nine major areas:

Public Aspects of Nuclear Use; Problems of Advanced Reactors; Nuclear Education for Engineers; Computational Problems in the Nuclear Industry; Application of Atomic Physics for Tests of Materials; Instrumentation; Testing Methods; Radiochemical Separation; Fuel Cycling and Nuclear Safety.

Sessions in these areas will be held concurrently, June 5 and 6. June 4 will be devoted to an all-day general session, at which a number of papers will discuss "Operating Experience with Power Reactors."

The Nuclear Congress was established in 1955 to promote exchange of ideas among engineers and scientists and the nuclear industry. At the April 1960 Congress it was decided to make the congress a biennial event. Manager for the 1962 congress is Newell Appleton, of the American Institute of Mining, Metallurgical and Petroleum Engineers.

ASCE will be represented on the Program Committee for the 1962 Congress by James G. Terrill, Jr., and J. H. Fooks.

ASCE Membership as of August 10, 1961

Fellows	11,122
Members	17,012
Associate Members	19,882
Affiliate Members	122
Honorary Members	50
Total	48,188
(August 9, 1960	46,160)

(More ASCE NEWS on page 82)

Billions for urban renewal

The engineer's role in urban renewal and what urban renewal can do for the individual city

JAMES W. FOLLIN, F. ASCE, Consulting Engineer, Washington, D. C.;
Urban Renewal Consultant to De Leuw, Cather & Company, Chicago, Ill.

In spite of the slow rate at which urban renewal appears to progress, the vastness of the total program is amazing. While only some 40 projects have been completed in 12 years, urban renewal has been authorized in over 40 of the 50 states, and nearly 500 communities have made some start. About 900 projects have been approved for federal assistance, and half of these are in process of execution.

Up to now federal financial assistance has been pledged to the amount of roughly $2 billion. Adding half of this sum for local participation, the total governmental expenditure is $3 billion, which will create some $15 billion in construction. Taxation of these construction operations, and on the use of the new structures so created, should pay off the $3 billion governmental investment in not too many years.

Increases in property taxes may be phenomenal. For example, the tax revenue from 14 projects in 9 cities is expected to increase from $4.6 million to $22.6 million after redevelopment, or by 400 percent. An even more pronounced increase in individual projects could be cited.

Compared with the $2 billion of federal aid pledged in about 12 years of operation, the new Federal Administration has been granted $2 billion by Congress, to be committed in the next 4 years. The door of opportunity will be indeed open for new communities.

A private-enterprise program

Fundamentally urban renewal is not a governmental program but a private enterprise program. It is true that local government must take certain steps to start a program but the actual rebuilding is done by private enterprise. Government must facilitate the efforts of private enterprise in several ways, as will be discussed later.

While urban renewal is a very significant program in most cities, it is at the same time only one of several programs aimed at adjusting the city to modern requirements, and preparing it for tremendous future needs.

Studies indicate that the population of the United States will double in the four decades from 1960 to 2000. All this vast increase will go into urban communities. Thus present urban development will have to be duplicated in the next forty years. The major problem ahead for any urban area is to guide and control the new growth so as to avoid the mistakes of the past, to provide much better communication, to assure the best use of land, and to expand public works, including water supply, sewerage, and drainage.

The civil engineer must take the major responsibility in this expansion, working with other engineers, with architects and planners. This points up the urgency of comprehensive city and regional planning, in which the engineer must cooperate fully with other professional groups.

Urban renewal alone cannot do this larger job but it can help. As time goes on, land for development will get more and more scarce. Surely blighted areas will not be overlooked. In the forty years under consideration, private enterprise is bound to pick up land in blighted areas but usually it will do this parcel by parcel.

The question is, can we afford to sit back and wait for this natural process to run its course? Can the city stand the loss in tax revenues resulting from depreciation while blighted land awaits redevelopment by private sponsors? Can human beings be allowed to remain in slums and badly run-down areas? Can our economy afford the losses in property values and family savings due to decline in values in blighted areas, for want of a program to check blight and encourage property owners to repair and modernize? Surely the answer to all these questions is no.

The 1960 census reports gave up-to-date information on the extent of blight in residential properties. Of the total of 58.3 million housing units reported, 80 percent were in sound condition, 15 percent were deteriorating and in need of repairs if they were to continue to provide adequate shelter, and 5 percent were dilapidated. Thus one-fifth of the nation's housing is unsatisfactory and in need of immediate attention. Other millions of units will slide down into the unsatisfactory class if conservation activities are delayed.

In the average city, blight is concentrated in a few areas, usually near the downtown section, but scattered throughout all the older areas. The exact pattern must be known in planning renewal efforts, and for the larger cities block statistics will shortly be forthcoming from the Census Bureau. Obviously the extent of blight in structures and in neighborhood facilities determines the type of renewal required.

The problem of depreciation and obsolescence is encountered in all private endeavor. In industry, plant and facilities are constantly renewed to meet changing conditions. While new properties are built to expand capacity, old structures and old equipment are not neglected. If properties are not frequently overhauled and modernized, the company may lose out in price competition.

Responsibilities of city government

Urban renewal also deals with depreciation and obsolescence. It is a program of community improvement in which the local government, or all the people, must play a dual role. In the first place, government must perform certain functions, such as ordaining or vacating streets, providing pavement, water supply, sewerage, drainage, fire protection, school facilities, and many other services. Second, government must facilitate the reuse of land, usually by private enterprise, by assembling the plots for clearance and assisting in the relocation of occupants, or in the case of a rehabilita-

tion area, by inspecting properties for conformance with housing codes or regulations governing minimum sanitary and safety facilities and extent of occupancy.

The most important and controversial item in this list of responsibilities of the city government is that of land assembly. Since appropriation is required for this purpose and cities usually lack authority to condemn for other than public reuse, special state statutes, in over forty states, have conferred on municipal authorities the power to condemn for removal of slums and blighted conditions, and to resell for private development.

Thus urban renewal is a locally conducted program with or without state or federal financial aid. Since it is an important part of the much larger program of urban development, it must be conducted in conformance with comprehensive city and metropolitan planning. Also, it must have the whole-hearted support of the municipal government. It cannot produce results if it is accepted only as something which "that temporary commission in the back room" is playing with. It belongs in the front office and in the council chamber. Also, it must be geared to the city's resources, but since it can produce revenues in the form of increased tax returns, it is a paying investment.

How to go about urban renewal

These conclusions prescribe certain steps, in sequence.

1. Drafting a program is the first step. The federal statutes state that all types of federal assistance are contingent on the community having a "workable program" for preventing as well as eliminating slums and blight. The President's Housing Commission in 1953 suggested that no federal funds should go to a community that was not trying to help itself by endeavoring to prevent future slums. This concept of a workable program has now been renamed "Program for Community Improvement."

The community fills out a prescribed application stating what facilities it proposes to provide in the way of city planning, financing, organization, codes and ordinances controlling property use, relocation of displaced families, and other conditions, and when it expects to complete these facilities. If acceptable, this program is certified for a year ahead, during which time the various federal aids are available to the city. At the end of a year, the city requests recertification and states what it has accomplished towards the several goals.

To date over 1,000 communities in the United States have applied for certification of workable programs, entitling them to federal assistance. But whether a community expects to get federal financial assistance or not, it is still a good thing to go through the process of "taking a good look at itself."

2. A "community renewal program" is next prepared. While no federal financial assistance is extended for the preparation of a workable program, once the city has such a certification, it can apply for a two-thirds federal grant to make a community renewal program. This is a city-wide general survey to locate blight, measure its intensity, determine types of renewal action needed, gage the adequacy of community resources and organization to provide the required treatment, and last, recommend a program of renewal action and the preferred order of action.

Probably the most important community resource to be tested is that of adequate finances to pay the city's share of the cost. One of the limitations that might be placed on the program is the ability of the city government to help those who will be displaced by urban renewal projects to relocate in satisfactory housing.

3. A renewal organization must be established to handle the job. Most of the state statutes that authorize cities to carry on urban renewal and to accept federal assistance have prescribed one or more ways in which the city can create an organization to administer the program. The city must provide an adequate budget for this organization, but as time goes on, part of its expense becomes a proper charge against the urban renewal projects undertaken. The city may also have to authorize other administrative organizations to carry on housing inspection or other operations.

4. Survey and planning of actual projects must be started. If federal assistance is utilized, funds will be advanced for the survey and planning of actual projects. These advances are not legal debts and are not repayable if the project does not proceed. If it does proceed, the survey and planning cost becomes a part of the total cost, and thus is eventually split—two-thirds federal and one-third local.

There are several types of urban renewal projects. Where it is necessary to clear all existing structures and start all over again, clearance is the distinguishing feature. The troublesome problem here is land acquisition. The most important task is to select the best use for the cleared land, considering the larger needs of the entire community. There is a fine opportunity here to improve the quality of the redevelopment.

In contrast to the "clearance project," the "rehabilitation or conservation project" is carried on in neighborhoods where deterioration has not progressed so far as to make it necessary to clear the land completely. In some projects spot clearance may be required. In others the only clearance required will be to provide land for community facilities, schools, playgrounds or parks, or for street corrections. The vexing problem in a conservation area is to secure the willing cooperation of property owners in making necessary repairs and modernization of their structures. In a typical community the program will be at least 75 percent conservation; the 1960 census results referred to above, support this percentage.

Still a different type of project is that known as the "general neighborhood renewal plan." A fairly large area, one that would usually be split into several projects, is included under survey and planning to get the benefit of a broader base. The result is a general neighborhood plan suggesting types of renewal action in various parts of the area and necessary public improvements, including street changes. When this plan is adopted by the city's legislative authority, it governs renewal in the larger area over a period of years. Importantly, it informs property owners as to proposed action in their neighborhoods, and permits them to proceed with renovation or rebuilding without delay.

5. Renewal projects must be carried through. Survey and planning activities necessarily take a long time, to make sure that the very best use is being made of present facilities in the project area, that the costs are within reason, and that there is a feasible plan to relocate displaced families.

After the renewal plan is drawn up, it takes additional weeks for examination by city planning authorities and the city council, and to get the final federal contract, if federal assistance is sought. But once the execution of the project is authorized, greater speed can be made in acquiring land, preparing cleared land for rebuilding, selecting competent redevelopers, and getting the rebuilding going. Only when the new facilities are built and occupied, will the increased taxes begin to flow into the city treasury.

On rehabilitation and conservation projects it is highly important to man the projects fully to give maximum assistance to property owners, especially in the use of the several special aids now provided. Assistance in the financing of residential construction,

or in modernization, is provided through special Section 220 of the Federal Housing Administration. Families displaced through governmental operations may acquire new or reconditioned properties without a down payment, utilizing special Section 221 of FHA.

The Federal Housing Administration recently requested, and Congress authorized a new type of insurance to aid in the rehabilitation and modernizing of family properties, supplementing the present Title I of FHA. This provision increases to 20 years the period of amortization, and to $10,000 the amount of the loan that can be made under this insurance to a property including up to four family units, at not more than 6 percent interest. Loans for the modernization of multifamily units have also been liberalized. It is believed that these new provisions will greatly expedite modernization and repair of properties.

Greater progress urged

The new Federal Urban Renewal Commissioner, William L. Slayton, states that he will concentrate on three areas that need emphasis in the urban renewal program. The first is production; there is need to increase the tempo and decrease the time between planning and actual construction. The second is comprehensiveness in renewal programs. Cities should be preparing comprehensive programs so that their individual projects will fit into an overall plan. The third area is good urban design. In rebuilding our cities we should make them beautiful as well as utilitarian.

There is no group in America that should be more interested in urban renewal than civil engineers. They understand more clearly than many others the why and wherefore of depreciation and obsolescence, the twin demons that cause urban decay. They are the ones principally responsible for city facilities and services, for public works of many kinds, for planning, designing and executing. They are the ones who will carry out most renewal plans and programs.

Hence civil engineers, and city engineers particularly, should be the leaders in urban renewal. This is their opportunity to do something basic for the communities in which they live.

(The author of this article, James W. Follin, served as Federal Urban Renewal Commissioner, Housing and Home Finance Agency, from 1953 to 1956. His address, on which this article is based, was presented before the 1961 Spring Meeting of the ASCE Oklahoma Section in Oklahoma City.)

Complex interchange for Chicago

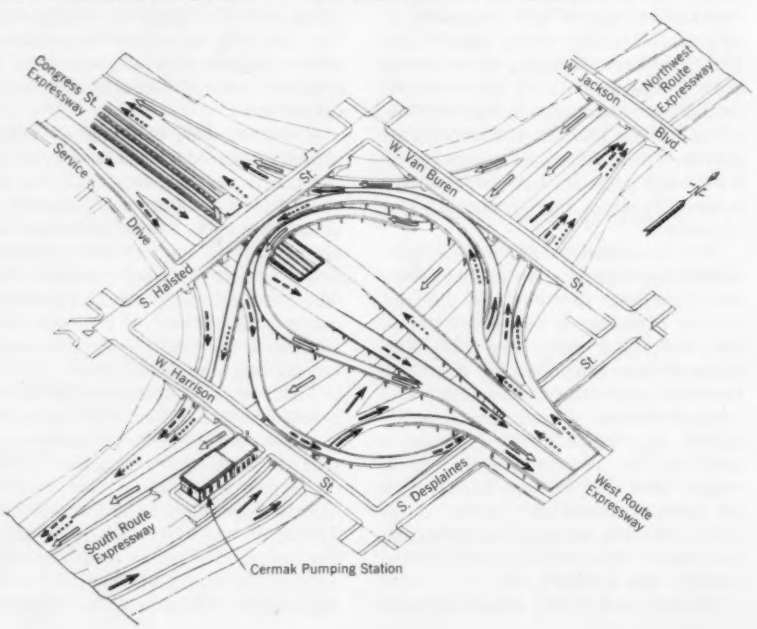
ONE of the world's busiest interchanges is scheduled for completion in the fall of 1961. It is Chicago's Halsted Street Interchange—between the Northwest Route Expressway, the South Route Expressway, and the east-west Congress Street Expressway. The major part is located within a city block (800 ft square or some 15 acres) between Halsted, Van Buren, Desplaines, and Harrison Streets near downtown Chicago. In this location the north-south route is depressed, and the east-west route is depressed under the Halsted Street overpass but rises over Desplaines Street to the east. The Halsted, Harrison, and Van Buren Street bridges are overpasses at the level of the city streets.

An interesting method is used to name the ramps of this interchange. For each ramp two letters are employed. The first is the abbreviation of the direction in which the vehicle is moving as it enters the interchange, and the last is the abbreviation of the direction in which it will depart. Thus the user of the SE ramp is traveling south on the Northwest Expressway, enters the SE ramp, and leaves the interchange moving eastward on the Congress Street Expressway, Fig. 1.

The interchange has characteristics resembling those of the four-level interchange in Los Angeles in that all movements are completely separated, reducing conflict to merging movements. However, the degree of refinement is somewhat less advanced in that left turns traverse a curve of considerably more than 90 deg. From the air the counterclockwise traffic movement will resemble that of a rotary intersection. Complicating the construction greatly is the fact that all progress is accomplished without traffic interruption on these busy routes.

Noteworthy is the planning for these

FIG. 1. Halsted Street traffic interchange in Chicago is designed so that all movements are completely separated, reducing conflict to merging movements.



—one of the world's busiest interchanges, Halsted Street Interchange, to be completed in fall of 1961

HANS F. BELL, A.M. ASCE, Civil Engineer for the City of Chicago, Ill.

expressways, which began many years ago in a general way. Detailed plans were developed shortly after World War II, and actual stage construction began with the completion of the center part of the Halsted Street overpass in 1950. The city-street overpasses were constructed after temporary at-grade bypasses were provided to preserve traffic flow during construction.

Two overpasses in the immediate vicinity were not constructed simultaneously to avoid excessive traffic aggravation. At that time the Halsted Street overpass was not completed as we know it today because to the north, the West Side elevated columns, and to the south, unacquired right-of-way, precluded construction in final form. Nevertheless there was a need for the Halsted overpass at that time, for in 1951-1953 the Congress Expressway elevated structure was constrcted towards the east, and later the expressway was paved below the Halsted overpass. The turnouts for the subsequent interchange ingress and egress ramps SE, NE, WS, and WN respectively, were incorporated into the elevated structure of the Congress Expressway.

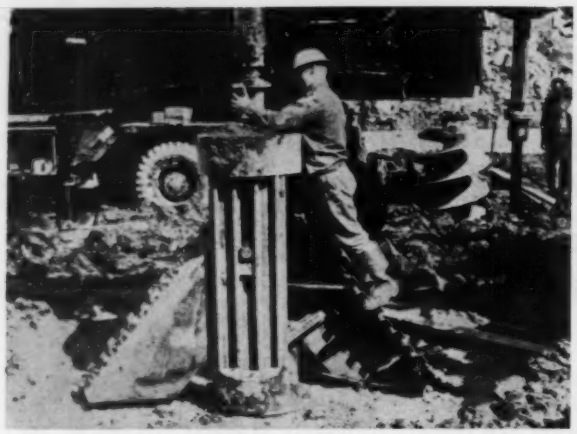
From 1954 to 1957 construction was largely confined to the completion of Congress Street Expressway west, together with the subway below the interchange, which later replaced the elevated structure to the north. In 1958 the portions of the SE and WS ramps over the Congress Expressway were constructed and immediately utilized as directional bypasses for the Halsted Street overpass and the construction of its approaches, the latter being completed the same year.

As the Northwest Expressway was completed west of the "loop" there came a demand for interchange between the two routes, and temporary EN and SW ramps were provided together with an eastbound exit onto the temporary Harrison overpass bypass. The Van Buren Street overpass was built in 1958, followed by the Harrison Street overpass in 1960.

In September 1960 the permanent SW ramp was opened to traffic, permitting removal of the temporary one, and the use of the land for subsequent subpier construction for the NW and WS ramps. The Harrison Street overpass bypass was also removed after the opening of the overpass to traffic, permitting subpier construction of the EN, WS, and NE ramps. The temporary EN ramp will not be removed until the permanent ramp is completed and put in service, and therefore main north-south roadway paving and SE ramp completion are contingent upon this removal.

Horizontal control is derived from four base lines forming a rectangle on

One of the world's busiest interchanges, Chicago's Halsted Street Interchange, is scheduled for completion late this year. Note that the Congress Expressway runs under the Chicago Post Office Building.



Belling attachment on drilling rig was used to produce the required bearing area when stiff stratum was reached.

Reinforced concrete bents that support the elevated roadway rest on subpiers which go down some 47 ft to stiff blue clay.

the sidewalks adjacent to the project. The *X* and *Y* axes of the grid system are the base lines of Halsted and Van Buren Streets respectively. The area east and south of these base lines (third quadrant) was designated as having both coordinates positive, so that for the majority of the points there are positive coordinates. All survey control points are given two coordinates from which position is determined by two right-angle transit intersections from adjacent base lines. This type of control permits immediate location without previous layout of the route centerline.

Piers belled out

The subpiers for piers (bents) and retaining walls are constructed through the soft blue clay down to very stiff blue clay, which occurs approximately at El. −47 ft, Chicago City Datum (C.C.D. 0.00=579.94 mean sea level, which is the approximate lake level). The shafts are "drilled" with various augers, ranging in diameter from 2 ft 3 in. to 5 ft. When they reach the stiff stratum, they are belled out to produce the required bearing area. After the steel reinforcement cages are positioned in the shafts, the subpiers are concreted. Just below the finished grade, a foundation girder connects and stiffens the pairs of subpiers supporting a pier. When the subpiers do not lie directly below the piers, as sometimes happens, the eccentric load is transmitted through the foundation girder. On occasion, off-center subpiers are necessary to avoid occupying regions reserved for future subway construction, main drains, and utility tunnels.

The superstructure consists of 36 WF girders varying in weight from 150 to 280 lb per ft, supporting a 7-in. reinforced concrete deck slab. The longest of these simple spans is 85 ft 9½ in. Cover plates are welded on the bottom of the beams only; automatically end-welded stud-bolt shear connectors anchor the deck to the steel girders to form effective T-beams. Cross-frame stiffeners are bolted near the top of the girder, usually at the quarter points, and to allow for slight field adjustment, the bottom stiffener gusset plate is field welded to the girder web. Over the piers the girders are stiffened with 18 WF 50 beams, the upper flanges of which are employed to attach the two halves of each of the expansion joints.

Falsework for the deck slab is supported from the top flanges of the girders by welded wire hangers which are supplied in different sizes, depending on girder size. These "saddles" support 2 x 6 cross members, on which fillers (cut in ⅛-in. increments) are nailed to adjust for beam camber and dead-load deflection. The ¾-in. plywood deck form is then nailed to the filler. A 4-in. fillet is formed on each side of the flange so that the flange is embedded in concrete on all three sides. This steel-and-concrete type of construction produces a structure that is pleasing in appearance and easy to maintain.

Approach slabs, the transitions between ground-level pavement and the elevated structure most frequently subject to bumps caused by settlement, are 20 ft long, reinforced with No. 8 hooked bars spaced 6 in. on centers running longitudinally, and with No. 5 bars, 6 in. on centers, running transversely. The approach slabs occur right at the abutment—on which they bear for a distance of 9 in. The other half of the abutment carries the deck slab. The lower part of the approach slab rests on stone subgrade. Where a ramp rises from depressed expressway to elevated expressway, the fill retaining wall terminates at the structure abutment.

Maximum grade for the ascending ramp is 6.54 percent and for the descending ramp, 7.21 percent. Ramp curves are superelevated at 4 percent. The minimum vertical clearance is 14 ft 3 in. The 22-ft ramps were paved with readymix concrete. The customary longitudinal metal joint plate, keyed and doweled, was employed on the ramp centerline. Main roadway paving will be placed with a standard paving mixer, starting each of the eight lanes at one end of the contract and terminating it at the other. A central lane will be paved first, after which the outer adjacent lanes will be paved. On tangent sections, the two center lanes of the roadway will have a parabolic crown of 1½ in. and the outer lanes will be paved flat, shedding water to both sides of the 48-ft roadway.

Curves superelevated

On circular curves all four lanes will be paved flat with a 1.5 percent superelevation. Spiral easements offer an excellent location for the introduction of this superelevation, and if such transitions are not available, the superelevation will be introduced outside the circular curve in the tangent section, usually for a transition of about 100 ft. Acceleration and deceleration lanes will be paved and struck off to the level of the steel mesh and topped with 2.5 in. of red concrete, colored by the addition of iron oxide pigment.

Actuated by a solar clock, the interchange will be fully illuminated. Light standards will be supplied alternately by each of two power circuits. Thus if

one circuit fails, the other will keep alternate lights in service.

The interchange grounds will be landscaped, lawn will be established, and shrubs and trees will be planted. There will be sprinkler service in each of the four corners. A 4-ft chain-link fence enclosing the area will keep "lost" people out.

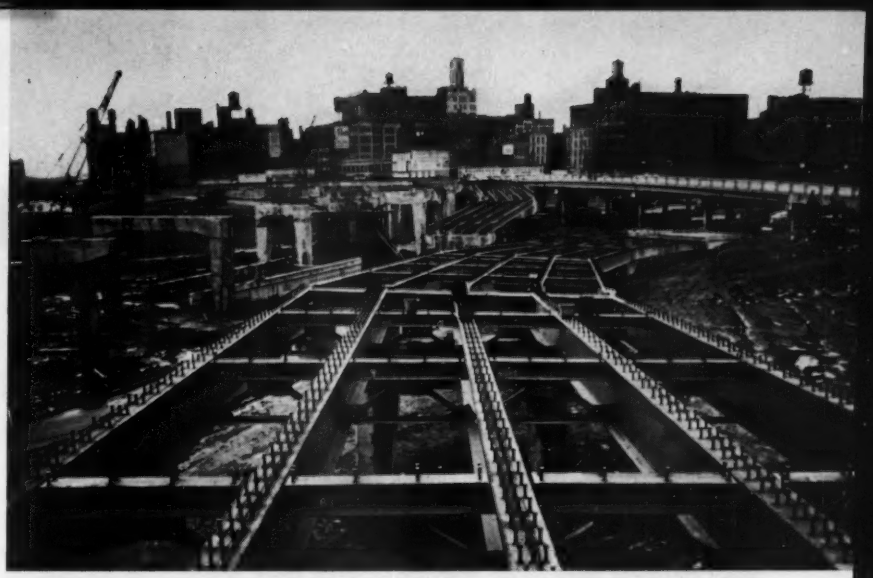
The anchorage assembly for the steel handrail will be supported from the forms and cast into the curb. (The overpass ramp width is 24 ft, plus a 2-ft 6-in. width of curb 11 in. high on both sides.) Base plates will then be bolted to the anchorage assembly and to the curb. The handrail will be fabricated from field measurements and will be field welded to the base plates, allowing for slight adjustment. Handrails will be constructed with columns set plumb and with members bent to the radius of the ramp.

The Cermak Pumping Station, built in 1934, will remain as an island landmark south of the Harrison Street overpass. Preserved between northbound and southbound roadways of the South Route, it handles most of the water for downtown Chicago. The need to provide access for trucks delivering chlorine to the pumping station from the Harrison Street overpass accounts for the unusual structural design. East of the pumping station, the lowering of the two 48-in. water mains and the one 54-in. main from street level to below expressway grade was accomplished without service interruption. The two 54-in. mains west of the pumping station were similarly handled.

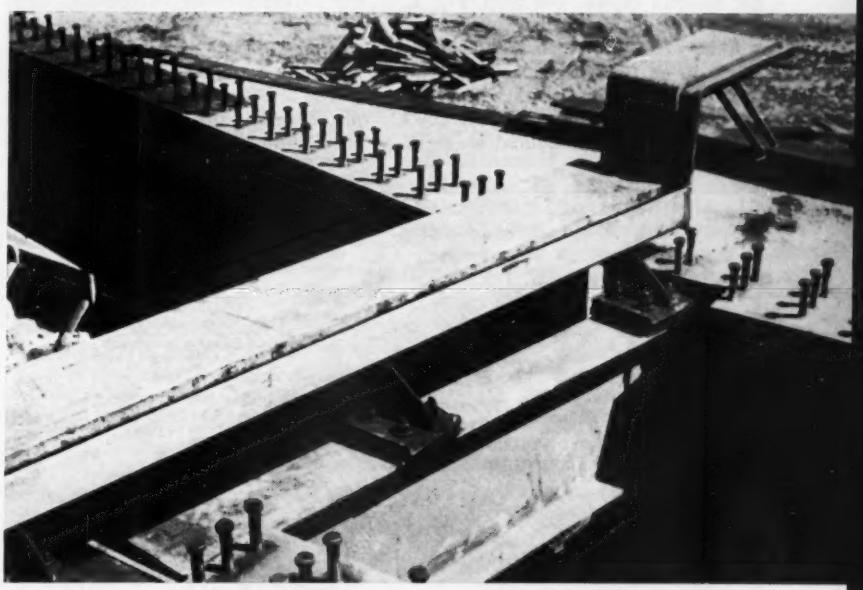
Construction of the interchange, not including the existing work of the Congress Street Expressway structure, those parts of the WS and SE ramps directly over that expressway, and subways, etc., will cost a total of about $2.5 million. In addition to the visible work there is a main-drain tunnel below the interchange, which will cost another half million dollars. This drain extends from the Van Buren and Desplaines lift station (where it absorbs the overflow from the main drain on the east-west route) to the Roosevelt Road lift station, a mile to the south.

The writer is unable to give an estimate of the cost of the complete interchange. Years of work have been spent in this area wrecking, relocating water mains and sewers, etc. A conservative guess as to the cost of construction in this area might be $10 million, and over.

The Halsted Street Interchange will be another milestone in highway transportation and an important central hub in Chicago.

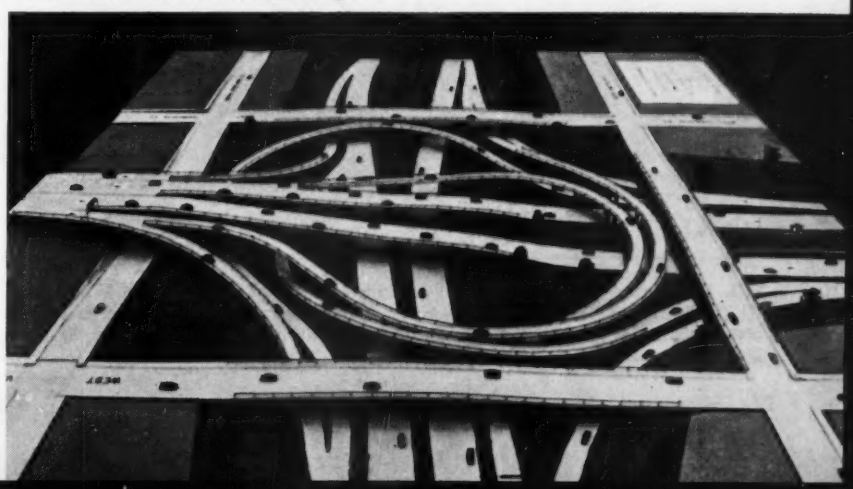


Superstructure consists of 36 WF girders which support a 7-in. reinforced concrete deck slab. Cross-frame stiffeners are bolted near the top of the girder, usually at the quarter points.



Over the piers the girders are stiffened with 18 WF beams. To the upper flanges of these beams the two halves of the expansion joint are attached. Photo shows both halves in place.

Model of the Halsted Street Interchange.



New filtration plant taps the Potomac

BERT PAGE SMITH, Project Engineer, Whitman, Requardt & Associates, Consulting Engineers, Baltimore, Md.

A 7-million-dollar, semi-automatic water treatment plant on the Potomac River is opening a new source of water supply for customers of the Washington Suburban Sanitary Commission in the Maryland area adjacent to the nation's capital. See map, Fig. 1. The plant's initial capacity of 30 mgd will be expanded in three additional stages to an ultimate capacity of 120 mgd required to meet the increased population expected by the year 2000 or sooner. Each additional stage of construction, planned to be about 10 years apart, will increase the capacity by 30 mgd. When all four stages are completed the area's supply of water will be increased by more than 200 percent over the only previous source, the Patuxent River, which had been developed to its capacity. The total cost of the plant is expected to reach $14 million.

The first phase of construction, completed earlier this year, included the installation of a number of components in sizes capable of meeting the ultimate production capacity. The river intake structure, the intake pipes, almost the entire raw-water pumping station, the chlorine building, the finished water pumping station, the headhouse and the main drain are large enough for the ultimate development. However, inside these buildings, only such equipment has been installed as will provide for the first 30 mgd of capacity.

The raw-water pipelines, the main transmission line, the high transmission line (Fig. 1), the electrical substation and the power supply lines, were constructed for half the projected capacity, or 60 mgd. Judging from recent water use, these units may not have to be enlarged for 15 or 20 years.

It was feasible to construct the flocculators, sedimentation basins, filters, water reservoirs and pumping equipment at one-fourth the projected total capacity. These units can readily be duplicated at intervals of 7 to 10 years—even earlier if necessary.

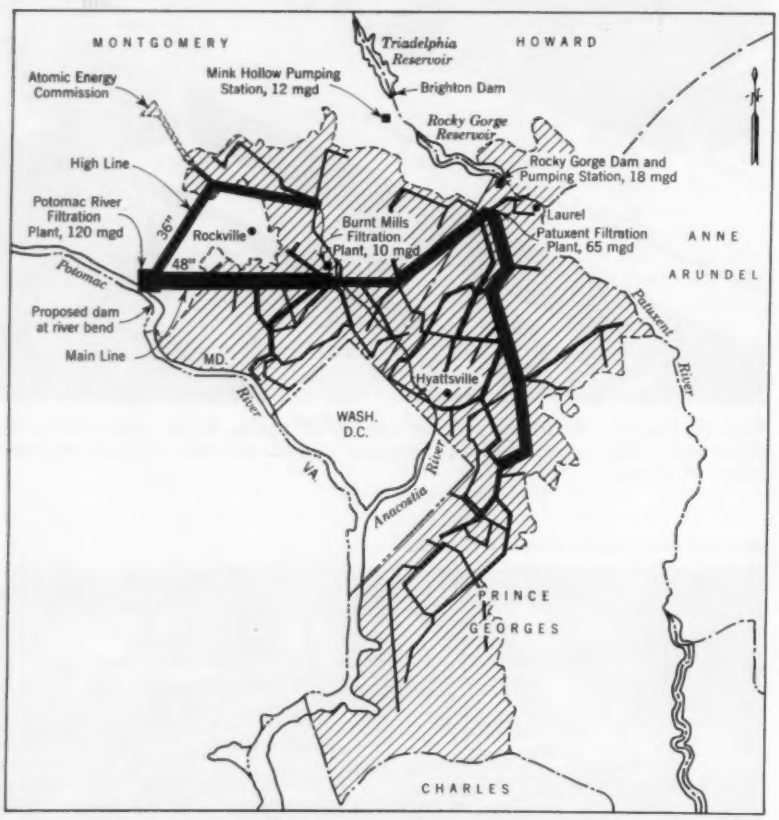


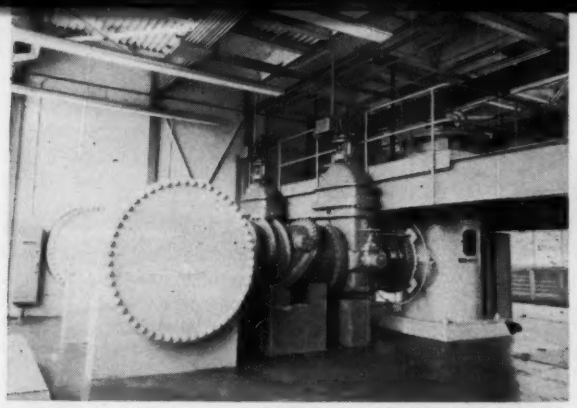
FIG. 1. Filtration plant for Potomac River water serves customers of Washington (D. C.) Suburban Sanitary Commission in southern Maryland, in hatched area. Two distribution lines running out from the plant, known as the High Line and the Main Line, serve more than 600,000 persons.

Site on high ground

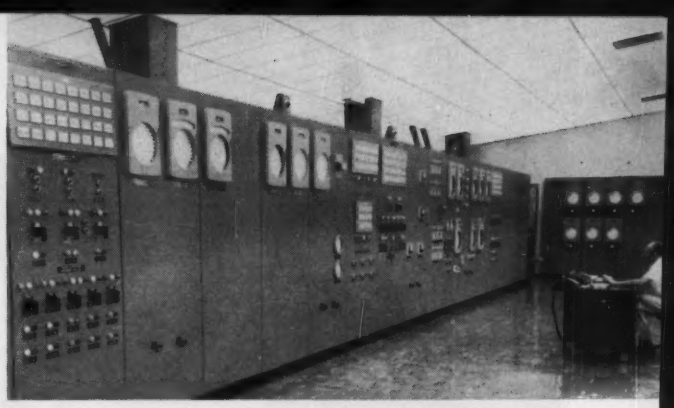
Located at a river level of about El. 160, the water filtration plant is about one mile upstream from the site of the dam proposed by the U.S. Corps of Engineers at River Bend on the Potomac. High ground at the site made it possible to construct the plant above the high-water level, at El. 246, behind this proposed dam. Provisions have been made in the design of the raw-water pumping station so that it can be raised above future flood levels without interrupting service.

A new channel, 60 ft wide but only a few feet deep, was excavated to bring water to the intake structure, which is located behind an island in the river. The channel continues downstream and returns to the river below the island. See Fig. 2.

Raw water enters the treatment works by flowing from the channel into the intake structure through bar screens consisting of 1-in. bars, spaced



In present stage there are two 1,000-hp vertical-lift pumps with 36-in. suction columns and discharge connections. Provision for four future pumps has been made.



Space has been provided for the installation of all instruments, alarms and controls needed for the operation of major plant equipment, both present and projected.

4 in. on centers. A pipe float 40 ft long and 24 in. in diameter, ahead of the screens, skims off logs or other large floating debris. Flood waters, which can be expected to rise about once in every ten years to a height sufficient to submerge the structure, will not disrupt its use.

Pumping station

From the intake structure the water flows by gravity through two 60-in. mains to the suction well of the raw-water pumping station. Here traveling screens, equipped with ¾-in. wire-mesh baskets, move in continuous loops slowly through the channel of incoming water. As the baskets rise from the water, debris that has been collected on the screens is sprayed off into the main plant drain and carried back to the river downstream from the intake.

The operating floor, where motors for pumps and screens are located, is 40 ft above the normal river level and 5 ft above the level of the estimated 1,000-year flood. In the future, when River Bend Dam is constructed, the operating floor of this structure will be raised 50 ft so that it will still be above the estimated 1,000-year flood. This can be done in stages, keeping half the station in operation. At that time, the present intake structure and suction pipes will probably be abandoned and a direct connection made between the reservoir and the suction well of the pumping station.

Two 1,000-hp Worthington vertical-lift pumps equipped with suction columns of 36-in. diameter are now in service. Each is capable of delivering more than 34 mgd. One pump is driven by a variable-speed motor that will permit regulated pumping rates ranging from 7 to 34 mgd. Vertical pumps were selected instead of horizontal pumps because of the considerably smaller structure required.

The station will ultimately have six pumps, each of 1,000 hp. The present pumps can be incorporated in the future pumping station after it is raised by lengthening the columns and shaft.

The suction columns discharge into a 60-in. main through which water is lifted up the steep Potomac bluff into the plant, 128 ft above river level. It was necessary to anchor this pipeline into the pumping station and into the rock of the hillside by means of a large thrust block.

A Simplex Venturi meter on the 60-in. raw-water main measures the quantity of water entering the plant. This device makes it possible to maintain a continuous record of plant flow and also to control the rate at which chemicals are added to the raw water, thus insuring the required standard of quality.

Chlorine building

The chlorine building is located as close as possible to the point of chlorine application in the raw-water main for prechlorination, and in the finished water mains for post-chlorination. One-ton cylinders of chlorine are delivered by truck and stored on a covered storage platform until needed. The customary scale room, evaporators, and prechlorinators and post-chlorinators have been installed. The capacity of the prechlorinators is 8,000 lb per day, that of the post-chlorinators, 2,000 lb per day.

A special feature of this plant is the dosage requirement controller, which anticipates and predetermines the chlorine demand of the raw water. The controller receives a sample consisting of a fixed amount of raw water before any chlorine is added. The sample is chlorinated by a pilot-plant system after a preset retention time. The chlorinated sample then passes through an amperometric type of chlorine detection cell for the residual chlorine reading. The result of this reading, converted to an electric signal, is fed into the prechlorinator. A signal proportional to flow is also fed into the prechlorinator. Both these control signals result in the proper output from the prechlorinator to produce the desired chlorine residual.

Because of the rapid changes in

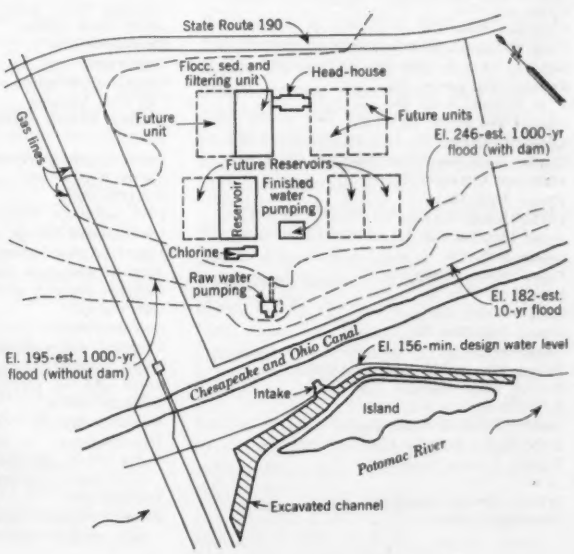
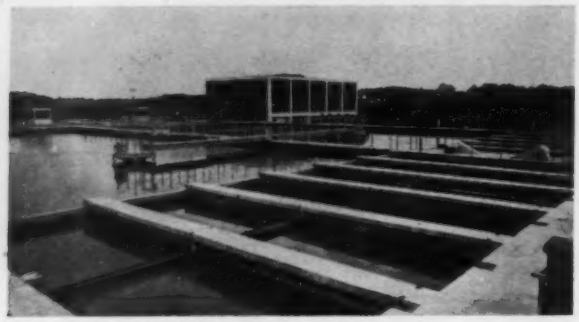
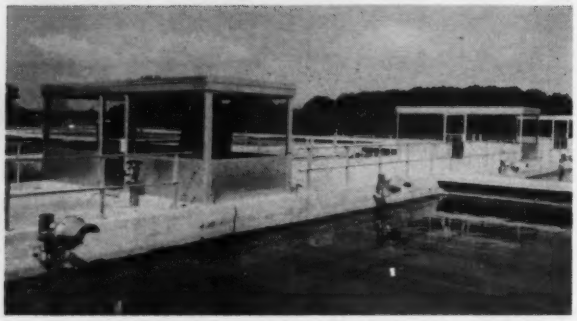


FIG. 2. Water filtration plant has initial capacity of 30 mgd, but various facilities are being incorporated for the projected maximum capacity of 120 mgd, to be obtained in three additional stages.



Flocculating tanks are seen in the foreground, with sedimentation basins, filter booths and head-house in the background. The mechanical flocculators have two rows of 15-ft-diameter paddle assemblies running the full width of the basins.



A detailed view of the operating booths shows arrangement for lighting the individual uncovered filters during backwashing after dark. After a filter has been washed, it can be put back in operation from the central control room.

quality to which Potomac River water is subject, it is believed that the predetermination of raw-water chlorine demand will result in better quality control. After prechlorination, the raw water continues through the 60-in. pipe to the bottom of the rapid mixing chamber. At this point an alum solution is added to the water and mixing takes place. A 15-hp, two-speed rapid mixer is designed to treat 60 mgd, half for the present plant and half for a future basin.

Flocculating basins. The flocculating basins contain two rows of flocculators, each 15 ft in diameter, with transverse flow. The basins have a detention period of 30 min at 30-mgd capacity.

Sedimentation basins. Flocculated water flows into the sedimentation basins through slotted baffles in order to distribute it evenly and slowly. The basins, each 75 ft x 150 ft x 17.5 ft deep, have a detention period of 2.4 hours and a surface loading of 1,330 gal per sq ft per day at a rate of 30 mgd. Circular cleaning mechanisms of 75-ft diameter are provided in tandem. The equipment is installed now in the first half of the basin only since it is believed the greater part of the mud and floc will settle here. If operating conditions require, a second cleaning mechanism can be installed.

Each of the four sumps for cleaning equipment has a 10-in. draw-off pipe to the main plant drain, which discharges back into the river downstream from the inlet. These draw-off pipes are equipped with telescoping valves so that the operator can observe the character of the sludge withdrawn.

Filters. After studies of several alternate designs, six filters of 5 mgd each were selected. The length of these filters coincides with the width of the settling basins, thus conforming to the site topography and to the plant layout selected.

There is no superstructure over the filters because it is believed that the ice problem on the filters can be handled as well as, if not better than, the usual ice problem on the surface of settling basins. A small enclosure with access from the pipe gallery is provided to protect the operator during backwashing operations.

Conventional sand filters with a 24-in. depth of sand, a 10-in. depth of gravel and rectangular vitrified clay filter blocks, were constructed. Each filter is 25 ft 3 in. x 50 ft 6 in. with a nominal capacity of 5 mgd at 2.75 gal per sq ft per min, or a total of 30 mgd for the six units installed. The plant's hydraulic capacity is more than this and it will be able to deliver water of good quality at a rate as high as 4 gal per sq ft per min or a total of 43 mgd for short periods of time.

A backwashing rate as high as 34,000 gpm (49 mgd) is provided by three 200-hp wash-water pumps. This provides a maximum wash-water rate of 43-in. rise per min. Two pumps pro-

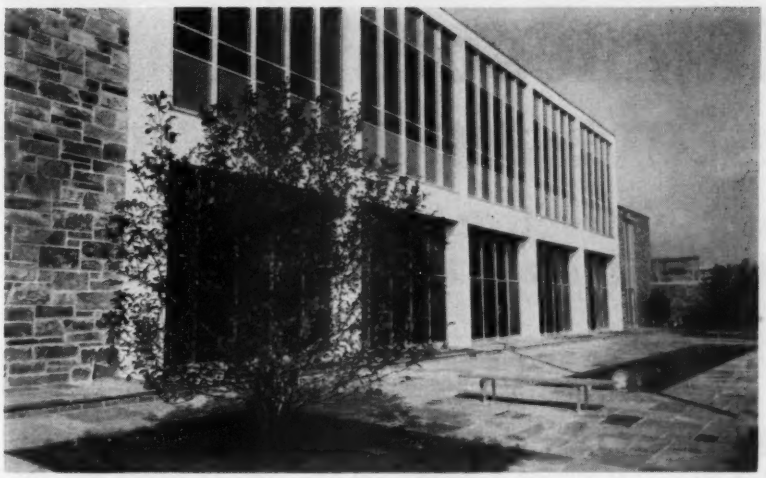
Potomac River Water Plant—partial list of manufacturers

Allis-Chalmers Manufacturing Co.	Cone valves
Aluminum Co. of America	Aluminum electrical conduit
American Marietta Co.	Concrete non-pressure pipe
American Monorail Co.	Crane and monorail
American Well Works	Telescoping valves
Bendix Corporation	Radio transmitter and receiver
Bethlehem Steel Corp.	Reinforcing steel
B.I.F. Industries Inc.	Instruments and controls
Borden Metal Co.	Aluminum handrails, gratings, etc.
Buffalo Tank Co.	Steel chemical storage tanks
Chain Belt Co.	Traveling water screens
Chapman Valve Co.	Swing check valves
Chas. F. Guyon Inc.	Steel pipe
Darling Valve & Mfg. Co.	Gate valves
Duralab Equipment Co.	Laboratory furniture & equipment
F. B. Leopold & Co. Inc.	Tile filter bottoms
Fischer and Porter Inc.	Chlorine feeding equipment
General Elevator Co.	Elevators
Golden Anderson Valve Specialty Co.	Pressure reducing valves
Happman Conveyor Co.	Chemical conveyors
Henry Pratt Co.	Butterfly valves
I.T.E. Circuit Breaker Co.	Elec. substation switchgear & transformers
Johns Manville Co.	Underground electric conduit
Josam Mfg. Co.	Floor and roof drains
Layne Bowler Pump Co.	Vertical washwater pumps
Lock Joint Pipe Co.	Concrete pressure pipe
Ludlow Valve Co.	Gate valves
Omega Machine Co.	Chemical feeders
Pangborn Corp.	Chemical dust collectors
Pelton, Div. Baldwin-Lima-Hamilton	Surge suppressors
Rodney Hunt Machine Co.	Sluice and tide gates
S. P. Kinney Co. Inc.	Butterfly valves
Simplex Valve & Meter Co.	Venturi tubes
U. S. Pipe & Foundry Co.	Cast-iron pipe
Walker Process Equipment	Rapid mixer, flocculation equipment, sedimentation-basin cleaning equipment
Wilson Electric Equipment Co.	Transformers
Worthington Corp.	Pumps: vertical low-lift, horizontal high-pressure, vertical washwater

vide a 30-in. rise per min. Filter sand has an effective size of 0.70 mm, with a uniformity coefficient of 1.4.

Three 36-in. filter influent pipes were installed, each to serve a pair of filters. Each filter discharges directly into the clear well beneath it. This arrangement made the pipe gallery relatively small since the only long longitudinal pipe in the gallery is the 36-in. wash-water header.

The pipe gallery contains the customary inlet piping, rate controllers, and wash-water facilities. The main drain pipe, of 48-in. diameter, is located under the pipe gallery floor. A catwalk was installed at an intermediate level so that the operator will have a covered access route to the small operator's booth on the top operating floor. The filter area will not be under cover.



Main part of the head-house building is constructed of reinforced concrete using white portland cement and special white aggregate.

Head-house

The head-house contains the central control room; the wash-water pumps; facilities for receiving, storing and feeding all chemicals except chlorine; an electrical substation; machine and meter shops; research and operational laboratories; and offices.

At the design flow rate of 120 mgd, as much as 15 tons of lime and 30 tons of alum may be required per day. Trucks enter the head-house on the first or ground floor and discharge their chemicals by gravity into large storage bins in the basement. Continuous tabular conveyors of 3- to 6-in. diameter move the chemicals from bulk storage to the chemical feeder hoppers.

Controls

From the main instrument panel on the second floor, one operator can control all plant functions. He can increase or decrease: (1) the raw-water pumping rate, (2) the main-zone pumping or high-zone pumping rate, or (3) the filter rate, or start and stop any filter, by remote control. He can backwash the filters by remote control although he will be required to observe the filter during the backwashing operation. The control panel also permits him to change the chlorine dosage rate if required. Signal lights indicate the operation of the chemical feeders so that he can readily inspect and adjust these in the nearby chemical room. Audible alarms as well as signal lights inform him immediately of any malfunctioning of equipment in other buildings.

The water levels of the controlling reservoirs of each zone are recorded on the instrument board so that the operator can adjust the filtering and pumping rates accordingly. The operator is connected by telephone and by radio with the central headquarters of the Washington Suburban Sanitary District in Hyattsville, as well as with mobile stations, so that he can receive any special instructions throughout the 24 hours.

The 750-kva electrical transformers and related equipment for the head-house and wash-water pumps are installed in a large, well-ventilated, underground vault adjacent to the truck entrance of the head-house. This location reduced the length of low-voltage wiring and eliminated the need for an above-ground transformer station.

A generator driven by a natural-gas engine provides 75 kw of electricity for emergency lighting, instruments, and other uses. However, no water can be pumped during a power failure.

A major feature of the Potomac River Water Filtration Plant is the finished-water pumping station, which will ultimately have nine pumps with a total of 16,000 connected hp. This station can ultimately pump 110 mgd through two force mains to the main zone and 50 mgd through two force mains to the high zone. At present five of the nine pumps are installed.

The topography permitted the pumping station to be located low enough to set the pumps below the bottom of the finished-water reservoirs, so that no priming of the horizontal pumps will be required. Customary cone valves and motor-operated discharge valves were installed on each pump. There are butterfly valves on the suction side of each pump.

The main suction-pipe header, of 66-in. diameter, receives water from each of the four (one at present, three future) covered reservoirs and is valved so that half of the header can be inspected at a time.

The structure is 68 ft wide and 104 ft long. A truck entrance door is provided so that the 15-ton traveling crane can remove equipment from a truck within the building. The electrical switchgear occupies the entire length of one side of the building. Because this station uses about 70 percent of the total plant electrical power, the main transformer station and related switching gear were installed immediately adjacent to it. The substation has a present capacity of 7,500 kva and an ultimate capacity of 15,000 kva.

The five main-zone pumps operate at 120 psig and 1,200 rpm. The four high-zone pumps operate at 185 psig and 1,800 rpm. All pumps are of the single-stage centrifugal type, driven by constant-speed synchronous motors.

The discharge manifold for the main zone is installed with outlets for future pumps and a connection for the future 54-in. second main-zone transmission main. The bends and tees of each manifold were anchored directly to the foundation slab of the pumping station and designed to resist thrusts as high as 500,000 lb.

Construction of this project is under the general direction of Robert J. McLeod, Chief Engineer, Washington Suburban Sanitary Commission. The plant will be operated under the direction of J. M. Jester, Assistant Chief Engineer. Supervision of construction is under the direction of Justin E. Farrell, Construction Engineer. Whitman, Requardt and Associates were retained to design the project and to furnish engineering and inspection services during its construction.

The first contract was awarded in January 1959, and the plant began operating earlier this year.

Minnesota's state-aid program—

made effective by teamwork between state and local agencies

J. M. EVANS, State-Aid Engineer, Minnesota Department of Highways, St. Paul, Minn.
ARCHIE N. CARTER, F. ASCE, President, Carter, Krueger & Associates, Inc., Minneapolis, Minn.

Forty years of experience with a state-aid highway program in Minnesota has emphasized the importance of cooperation in intergovernmental relationships. Like the keystone in an arch, cooperation is the essential factor required to permit all the components to function effectively. Unified effort is the one component that can be advantageously accented.

All the experience gained from the many past years of state-county relationships was carefully considered by the Minnesota Legislature in drafting the 1957 State-Aid Statute, which redistributed road-user funds in the state. In addition to increasing the funds available to the counties, it made provision for the direct allocation of state-aid funds to cities and villages of over 5,000 population, plus indirect aid to smaller municipalities.

This new and expanded county and municipal state-aid street and highway program is now in its fourth year of operation. The degree of acceptance with which it has been received by the 87 counties and 77 eligible municipalities is evidenced by the fact that the 1961 Minnesota Legislature has not received a single request to amend the present law. It is therefore of interest to note some of the statutory provisions that were designed to insure a maximum of intergovernmental cooperation.

Only the broad authority delegated to the state's Commissioner of Highways and the local officials is spelled out in the law. To the greatest extent possible, all administrative detail is incorporated in the approved Rules and Regulations. The latter are established by the Commissioner, acting with the advice of county and municipal committees, after public hearings. Each county committee consists of nine members, selected by the State Association of County Commissioners so that each member comes from a different state highway construction district. Not more than five of the members can be county commissioners; the others must be county highway engineers.

Each municipal committee, which is selected by the state-wide Association of Municipal Officials, has twelve members, one from each construction district and one from each of the three Minnesota cities of over 100,000 population. Of the twelve members, not more than six can be elected officials, the remaining members being city or village engineers.

The two committees just described actively assisted in drafting the first Rules and Regulations. They aid in preparing revisions and participate in public hearings. Thus, in Minnesota, the cooperatively developed Rules and Regulations are very easy to revise and have the full force of law.

Selection of a system of state-aid roads or streets for each county or municipality is by joint agreement between the local governing body and the State Commissioner of Highways. Local officials can select their own construction projects, but the plans for them must be submitted to the Commissioner for approval.

Minimum design requirements have been cooperatively established to insure that every construction project approved for state aid is built to approved engineering standards, consistent with anticipated traffic volumes. The selection of construction projects, design features and surface

TABLE I. Design criteria for rural roads

	Average Daily Traffic Volume Projected for 20 Years in Future			
Roadbed and surface geometrics:	Under 100	100-399	400-999	Over 1,000
Base design	....	5-ton	7-ton	{7-ton / 9-ton ult.
Surface type	Traffic bound	Flexible	Plant-mix bituminous or portland cement concrete	
Subgrade width, ft	24	30-32	32-34	34-36
Finished roadbed width, ft	24	26	28	30
Surface width, ft	22	22	24	24
Bridges, new (rural and urban):				
Clear width, ft	24	*24	30	—
Design load (AASHO)	H-20	H-20	H-20	—
Design speed, minimum, mph:				
Flat	45	50	60	60
Rolling	40	50	50	50
Mountainous	30	40	45	50
Curvature, maximum, deg:				
Flat	10	8	5	4
Rolling	12	10	8	5
Mountainous	22	14	10	8
Gradient, maximum, percent:				
Flat	5	4	3	3
Rolling	7	5	5	4
Mountainous	10	8	7	6
Non-passing sight distance, minimum, ft:				
Flat	320	350	475	475
Rolling	300	350	350	350
Mountainous	275	300	320	320

*Minimum of 24 ft but not less than 2 ft wider than surfaced widths on structures of 80 ft or less in length.

type is determined by the local officials but must be consistent with the minimum requirements.

Rural design standards

Sections of county state-aid highways in areas that are insufficiently developed to warrant the use of a municipal design must conform to the rural design standards given in Table I.

The design geometrics for the construction or reconstruction of the municipal state-aid streets are related to the type and volume of projected traffic and must provide the necessary width to accommodate the specified number of normal traffic lanes and parking lanes. A minimum width of 2 ft is included for driver reaction from all medians, curbs and other obstacles. Table II indicates the minimum roadbed widths for municipal design.

The minimum bridge standards for urban projects are the same as for rural design. Consideration is given to constructing all short-span structures to the full shoulder width of the road. On municipal projects, an effort is made to meet the rural design standards for maximum degree of curvature and maximum gradient, wherever feasible.

Those sections of county state-aid highways located through areas that are sufficiently developed to warrant the use of a municipal design, may be improved in accordance with the standards adopted for similar traffic volumes on the municipal state-aid streets.

Similarly, the municipal state-aid streets located through areas that are not sufficiently developed to warrant the use of a municipal design, may be improved in accordance with the rural standards adopted for similar traffic volumes on the county state-aid highways.

Funds annually allocated to each county and municipality for construction and maintenance are retained under the control of the Commissioner. Normally not more than 40 percent of the funds allocated to a county may be used for maintenance of that county's state-aid network; the remaining 60 percent must be used for new construction. A municipality may use up to 25 percent of its aid for maintenance, but many communities are using all their aid for new construction and are utilizing their own funds for maintenance and repair.

Construction funds are released only after approved projects have been placed under contract or are in operation under an approved force-account agreement. The initial pay-

Standards for state-aid projects in rural areas of Minnesota call for good alignment, gradual grades, and flat side slopes and back slopes to provide maximum safety and to reduce maintenance.

Bridges are designed in accordance with H-20 loading of the AASHO standards and are built to provide many years of service.

TABLE II. Minimum roadbed widths for urban design

Total width in feet, face to face of outer curbs

Through Lanes							
Number of lanes	Lane width, ft	Undivided, No Parking Lanes	With Median, No Parking Lanes		Undivided, with Parking Lanes		With 4-ft median and Two Parking Lanes
			4-ft med.	14-ft med.	One side	Both sides	
2†	A* 10	..	..	..	..	40	..
	B 11	26	..	..	..	42	..
	C 12	28	..	..	36	44	..
4	A 10	44	48	58	52	60	68
	B 11	48	52	62	56	64	72
	C 12	52	56	66	60	68	76
6	A 10	64	68	78	72	80	88
	B 11	70	74	84	78	86	94
	C 12	76	80	90	84	92	100
8	A 10	84	88	98	..	..	..
	B 11	92	96	106	..	..	..
	C 12	106	104	114	..	..	..

* Minimums.
† Consider only where continuous shoulder or parking lane is provided on each side.
A Absolute minimum, to be used only under extreme conditions.
B Acceptable minimum, where conditions warrant.
C Desirable minimum, wherever feasible.

As with projects in rural areas, municipal improvements in Minnesota are designed to carry the traffic expected twenty years from now. For this project in the city of Rochester (top), a portland cement pavement 8 in. thick and 44 ft wide is provided. For expected future heavy traffic, a road in the same city (immediately above), has asphaltic concrete pavement 66 ft wide. Standards for municipal projects call for good alignment and gradual grades.

ment consists of 90 percent of the total cost, and final settlement requires project approval and acceptance by the district engineer of the State Department of Highways.

Maintenance allotments are released in accordance with an established schedule which provides for payments of 50 percent in January, 40 percent in July, and final settlement at the end of the year, subject to the district engineer's certification of satisfactory maintenance by the local agency of its entire state-aid system.

$38 million yearly

About $29 million annually is distributed to the counties and another $9 million to the municipalities, for use in the maintenance and construction of the selected state-aid systems. Separate legislative formulas control the distribution of the county and municipal state-aid funds.

The county formula consists of four factors: 10 percent for equal distribution, 10 percent on motor vehicle registration, 30 percent on approved state-aid mileage, and 50 percent on the "money needs" of the approved state-aid system. Only two factors are used in the municipal formula: 50 percent on population and 50 percent on the "money needs" of the state-aid streets.

The law provides for the appointment of county and municipal screening committees, which determine the state-aid mileage and the approved "money needs" for each local unit. Membership on a county screening committee is restricted to county highway engineers, and membership on a municipal screening committee to city and village engineers. The major function of both these committees is to screen the estimated "money needs" as reported for every segment of each county state-aid highway and municipal state-aid street. A preliminary, but unofficial screening also is provided for on a district basis, first by the State-Aid Engineer and then by the county or city engineers in that district.

Small communities also get aid

Assistance to municipalities of less than 5,000 population is provided under county management. In addition to the regular county state-aid highways running into or through these municipalities, the county can request the designation of important business-access or local arterials as county state-aid highways. A municipal account is then established for each county, for which an allotment is made in the direct ratio that the money needs within these municipalities bears to the total needs of the entire county.

This procedure has resulted in about 10 percent of the allotments to the counties being restricted to use within these smaller municipalities, which are not eligible for a direct appropriation. In the past three years the counties have thus maintained 1,301 miles of streets in 751 municipalities of less than 5,000 population. During these three years a total of 259 miles of improvements have been constructed within 309 of the smaller municipalities. The total cost of this program was $6.4 million.

Other sections of the law provide for cooperation between the counties and municipalities on all county designations within municipal limits. Wide latitude is permitted in sharing the responsibility and costs in any manner that is mutually agreeable. Lacking an agreement, the county can pay a specified minimum to a municipality for the annual maintenance of the mileage of county state-aid highways within the limits of that municipality.

Sizable funds are also set aside in Minnesota for disaster conditions within the counties and municipalities. When disaster funds are requested, the Commissioner appoints a review board of engineers and elected officials to handle the request. All members of the review board are selected from counties or municipalities other than those applying for such aid.

Professional engineers must prepare plans

One of the first provisions of the Rules and Regulations, which are tantamount to law, requires that each county and city, as a condition to receiving state-aid funds, must have an adequate engineering staff to handle the maintenance and construction work on its state-aid system. This regulation is perhaps the most important

provision of all, for cooperation in the development of a street and highway program requires complete understanding of an engineering problem and this understanding can only be accomplished between engineers. Numerous communities too small to employ full-time municipal engineers, or in need of assistance for their engineering staff, have retained consulting organizations. This practice has made it possible for the smaller communities to secure adequate plans and construction supervision.

Cooperation cannot, of course, be effected solely through legislation, but it is much easier to obtain where the law creates a favorable climate. This has been accomplished in Minnesota through the proper recognition and division of authority between the state and the local units of government. Centralized management and accountability has not been diminished in the process. State and local groups have worked together in perfect harmony, in the knowledge that they are part of a team with a common objective—to promptly convert all road-user funds into urgently needed transportation facilities, designed and built to suitable standards.

Program effective

The record shows how well this objective is being achieved. During the first three years of operation under existing legislation, a total of $101,167,102 was distributed to the counties and municipalities. Part of this fund had to be earmarked for maintenance on the county and municipal state-aid systems, which total slightly more than 30,000 miles in length. Within this period the local engineers have planned and built 5,742 miles of street and highway improvements at a total cost of $81,263,399.

There has been some local opposition to the 44-ft minimum surfaced width for municipal streets and the requirement that only parallel parking is allowed as opposed to diagonal parking. However, this opposition is generally forgotten after the new facility is completed and its benefits are realized.

One of the intangible results of this state-aid program, after only three years of operation, is the mutual respect and esteem that have developed between state and local engineers. Even greater progress is expected in the years ahead.

(This article is based on the paper presented by the authors at the ASCE Phoenix Convention, in the Panel Discussion on County Highway Management at a Highway Division session.)

In building new bridges in rural areas, the width of the deck is considered sufficient to allow for driver reaction. Much consideration also is given to good alignment of approaches.

Major features of Minnesota State-Aid program to counties and municipalities

1. All state-collected road-user funds are divided among the state, the counties and the municipalities according to legislative formula based on the relative need of each agency.
2. County and municipal allotments are credited to the local governmental units but retained under the control of the state's Commissioner of Highways for release only on approved operations.
3. All construction and maintenance expenditures on the approved state-aid systems must be under the direct supervision of a qualified local engineer and the general supervision of the state's Department of Highways.
4. The Rules and Regulations, as well as design standards, have been cooperatively developed between the Commissioner and representatives selected by the local officials.
5. Design standards have been established to provide adequately for anticipated traffic on a 20-year projection.
6. Definite policies have been established limiting the use of state-aid funds for right-of-way acquisition, construction or reconstruction of storm sewers, street lights, sidewalks and public utilities.
7. Equitable fund distribution is assured by the screening committee of local engineers, which reviews all reports for needs and decides where mileage additions are to be authorized.

When improving routes in densely populated urban areas of Minnesota, major effort is made to obtain a finished street of maximum capacity, including the use of gradual grades and good sight distances, plus the elimination of parking on each side. This project, in the City of Richfield, was completed in 1959.

Conveniences for Ohio campers

FRED J. MAY, Senior Associate, Alden E. Stilson & Associates, Limited, Columbus, Ohio

Today more Americans than ever camp out—for fun and economy. With the limited areas available for camping a high standard of sanitation facilities is necessary. To protect the health of the campers the Ohio Department of Natural Resources, Division of Parks, recently completed excellent water and sanitary waste installations at the Rocky Fork State Park near Hillsboro, in southwestern Ohio.

Provision was made for 142 camp sites at a cost of $146,300. The 20-acre camping area is lightly wooded and slopes gently toward Rocky Fork Lake. The camp sites are served by one centrally located washhouse, five latrines, and eleven combined drinking fountains and waste drains spaced conveniently throughout the area. Planned for future construction is a commissary where camping provisions will be sold. The washhouse has shower and laundry facilities in addition to flush toilets, urinals and lavatories. The laundry has stationary tubs, two automatic washers and one automatic dryer. Hot water is available from a 200-gal unit heated by gas.

Four of the latrines contain three flush toilets and three lavatories for women; and two flush toilets, one urinal and three lavatories for men. Maximum distance from a tent site to the facilities is about 200 ft. All plumbing in the washhouse and latrines conforms to the Ohio Plumbing Code.

Water supply

Water is taken from the Clear Creek branch of Rocky Fork Lake. The water, from a submerged intake 700 ft offshore, is brought through a 4-in. gravity supply pipe to a pumping structure on shore. A centrifugal pump, electrically driven, forces water through a 2-in. pipe to the treatment plant. Capacity criteria are:

142 camp sites at 100 gpd	14,200 gpd
Commissary (future)	2,000 gpd
Manager's residence	750 gpd
Total	16,950 gpd

Treatment consists of slow sand filtration in two 6-ft x 8-ft units, with chlorination. Storage is provided by a clearwell of 25,000-gal capacity adjacent to the control room. Service is provided by an automatically controlled hydropneumatic system including pressure tank, compressor, and service pump. The washhouse, latrines and fountains are supplied through a distribution system from the pressure tank.

Raw-water pumping and treatment are automatically controlled. Adequate valving makes it possible to use either or both filters and to shut off equipment for repairs.

Sanitary waste

Sanitary wastes from the washhouse, latrines, fountains and waste drains, and from the manager's residence, are collected in 6-in. vitrified clay-pipe sewers and taken to a treatment plant. Sewer gradients provide for a minimum velocity of 2 fps. Manholes are placed at all changes in sewer alignment or grade, at all sewer intersections, and at intermediate points on long runs. Pipe joints are of the premolded bituminous type.

Sanitary wastes are treated by a package-type aerobic digestion plant. It includes an inlet box, screening and cutting mechanism, aeration tank, settling tank, froth control system, and effluent trough. Air for aeration, air lift for sludge return and for froth spray, are provided by two blowers housed in a separate structure. Plant effluent is discharged to the lake through a 6-in. outfall sewer. The 50-ft length of outfall extending into the lake is protected by stone riprap. The outfall discharge point is approximately 1,700 ft downlake from the water supply intake.

Electric service to the water treatment and sanitary waste treatment plants is single phase 220/110 v, the only service available in the area. The electric motors, the largest of which is 10 hp, have a capacitor start with magnetic combination starters. Frost protection for the water and sanitary waste plants is provided by electric heaters.

The facilities are operated only in the spring, summer and fall months. The water plant can be operated off season to refill the clearwell. Washhouse, flush-type latrines, and fountains are drained during freezing weather. The one pit-type latrine is retained for the off-season use of hunters and park personnel. Sanitary wastes from the manager's residence are bypassed to a septic tank during the winter months.

Project costs

The total cost of $146,300 includes water lines, sanitary sewers, water treatment plant and intake, sanitary waste treatment plant, washhouse, latrines, fountains and waste drains, engineering, construction inspection, and miscellaneous expenses. The breakdown follows:

1. Water treatment plant, including 25,000-gal clearwell	$ 21,800
2. Water intake (700 ft offshore)	12,700
3. Water lines (3,150 lin ft)	12,100
4. Sanitary waste treatment plant	32,400
5. Sanitary sewers (4,200 lin ft of 6-in. pipe, 15 manholes)	24,300
6. Washhouse with showers and toilets	20,250
7. Four latrines	20,350
8. Eleven fountains and waste drains	2,400
Total	$146,300
Unit cost per camp site	$ 1,030

The facilities were authorized and paid for by the Ohio Department of Natural Resources. Herbert B. Eagon is director, and F. O. Kugel, now retired, was chief engineer. The Ohio Department of Public Works served as the contracting agency. T. J. Kauer, F. ASCE, is director, and Lee W. Blackburn, also now retired, was engineer at the time.

These improvements were designed by Alden E. Stilson and Associates, Limited, consulting engineers of Columbus and Cleveland. Plans were reviewed by the Ohio State Department of Health. The facilities were constructed under three separate contracts: general, S. T. Kenyon & Co., Inc., Portsmouth, Ohio; plumbing, Hanagan Construction Co., Urbana, Ohio; and electrical, Bowers Electric Co., Inc., Chillicothe, Ohio.

Water works statistics

Intake. In Rocky Fork Lake, about 700 ft offshore in dredged area. Structure is a 36-in. corrugated metal pipe set on end on a 12-in. concrete base. Height inside is 4.5 ft. Top, submerged 5.5 ft below normal lake level, is covered with hardware cloth on a removable frame.

Raw-water supply. A 4-in. galvanized steel gravity line supplies water from the intake to the pumping structure on shore. Pumping structure is a welded steel pipe of 42-in. diameter with a ¼-in. wall and a height of 17.5 ft. Lower end is supported on a concrete base, and covered top is 8 ft above grade. Pump, of 30-gpm capacity, with weatherproof electric motor, is mounted on top of structure and has automatic controls and standard valving. Discharge line to water treatment plant is 2-in. galvanized steel 520 ft long.

Water treatment. Plant consists of influent box, two 48-sq ft slow sand filters, two hypochlorinators connected to filter discharge, a 25,000-gal clearwell, and hydropneumatic pressure system. Included are 1,650-gal pressure tank, compressor, 135-gpm service pump, and automatic controls.

Distribution. Galvanized lines are 3 in. and 4 in. in diameter. Pipe is buried to provide a minimum cover of 3.5 ft to prevent freezing.

Sanitary waste statistics

Sewers. For the 4,200 lin ft of 6-in. vitrified clay pipe, gradients range from 0.6 to 8.75 percent. Maximum manhole spacing is 400 ft.

Waste treatment. Aerobic digestion plant, of package type, as manufactured by Chicago Pump Co., has screening and cutting mechanism for average flow of 15,000 gal per day. Aeration tank, 10 ft x 16 ft, with 9-ft water depth, has 10,800-gal capacity. Settling tank is 10 ft x 5½ ft x 12¼ ft deep, with volume of 416 cu ft. Two 70-cfm blowers, of 4-psi pressure, are located in a concrete-block blower house.

Effluent sewer. Discharge is through 440 lin ft of 6-in. pipe to an underwater outlet 1,700 ft down-lake from the water supply inlet.

Washhouse with toilets, shower facilities, and laundry is centrally located.

Latrines, fountains and waste drains are spaced conveniently through camp area.

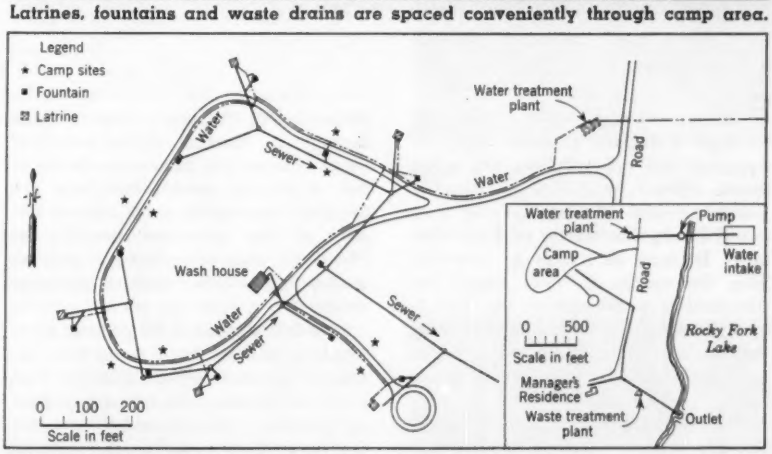
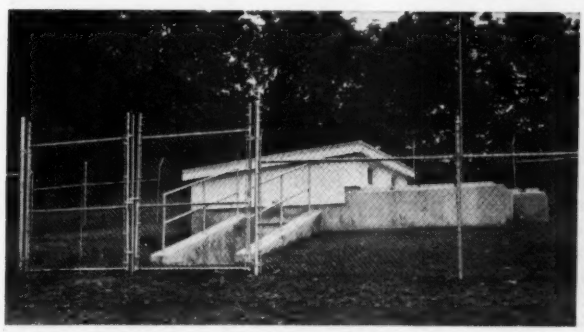
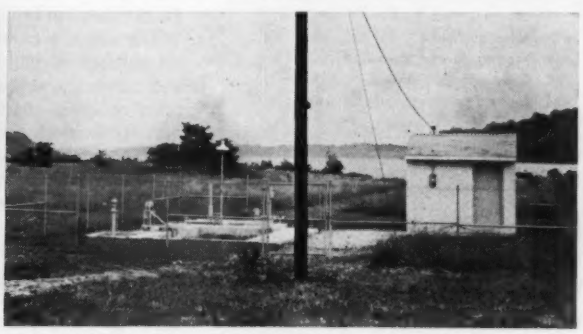


FIG. 1. Camping area at Rocky Fork State Park covers 20 acres.



Control building for water treatment plant has slow sand filters at right, and 25,000-gal clearwell below ground at left. Capacity provides for 142 camp sites at 100 gpd each.



In park's sanitary waste treatment plant, screening and cutting mechanism, aeration tank and settling tank are at left, and blower building at right.

Photo 1. Most of the waste treatment facilities are located in front of the row of trees running across this overall photograph of the refinery.

From refinery wastes to potable water

WALTER T. McPHEE, M. ASCE, Vice President, and **ARNOLD R. SMITH, M. ASCE,** Senior Engineer
Hydrotechnic Corporation, Consulting Engineers, New York, N. Y.

Passing treated refinery wastes through a display fountain and an aquarium stocked with lake fish is the proof offered by Cities Service Oil Company Ltd. of Canada that it is not polluting the waters of Lake Ontario. Because its wastes go into this lake, the source of water supply for surrounding communities, the Trafalgar Refinery sends its waste liquids through a ten-unit plant that provides an extremely high degree of treatment.

The complete waste treatment facilities comprise:

1. Stripping of sulfides and ammonia
2. Oil and tank bottoms separation
3. pH adjustment
4. Temperature adjustment
5. Chemical coagulation and precipitation
6. Two-stage biological oxidation
7. Final settling
8. Ozonation
9. Adsorption
10. Filtration

Cost analyses showed that the most economic overall process was a combination utilizing the most efficient steps of these ten operations.

Plant description

The first phase of the treatment, the stripping of sulfide and ammonia, is done in a process unit of the refinery proper. The stripped wastes pass through a Parshall flume for flow measurement and then into the head end of the oil separators. These are the four rectangular units seen to the right of the treatment building in Photo 1. Two are used for process wastes and two for surface drainage waters.

The first section of the process separators is covered by a hood to minimize evaporation of hot volatiles. This is one of the measures taken to reduce air pollution. Oil recovered from the separators is pumped to the used-oil tank just behind the right side of the main treatment building.

The effluent from the process-water oil separators contains slugs of acid and caustic, and also heavy concentrations of other materials. These could play havoc with the treatment process if allowed to pass through without preliminary adjustment. This is accomplished in two steps.

The first step is carried out in the equalization basin, the second basin from the right in foreground of Photo 1. (The basin on the extreme right is used for emergency overflows.) The equalization basin, also seen in Photo 2, was made large enough to hold the total flow through the plant for 24 hours at the design rate of 360 gpm.

A pipe in the center distributes the waste throughout the length of the basin. Piers to left and right of center carry air headers and steam lines. The air is for mixing, and the steam of course is to prevent freezing in winter. Floating oil is skimmed off at the discharge end of the basin.

From here, the waste is pumped through heat exchangers in the treatment building. pH is adjusted automatically by pumping acid or caustic into the pump discharge line. From the heat exchangers, the waste passes to the head end of the flocculator-clarifiers. An alum solution is added after the waste has been heated.

In the flocculation tanks (Photo 3), air is used to gently mix the waste and alum solution. A perforated baffle separates the flocculation and clarification compartments.

From the flocculator-clarifiers, the waste goes to the aeration tanks, which are rectangular in shape and are located under the trickling filters. The waste is discharged over a V-notch weir running the length of the tanks. This is done to keep the air requirements within practical limits in all parts of the tank. Each aeration tank has a detention time of nine hours at

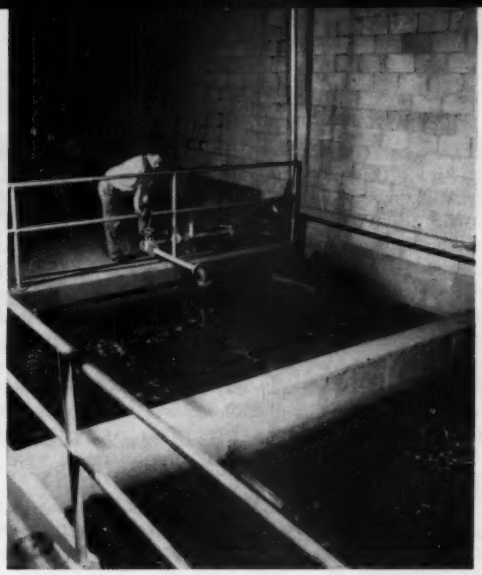


Photo 2. (far left) Equalization basin was designed to hold the flow for 24 hours at the design rate of 360 gpm. Floating oil is skimmed off at discharge end in background.

Photo 3. (left) In the flocculation tanks, air is used to gently mix the waste and alum solution. A perforated baffle separates the flocculation and clarification compartments.

TABLE I. Effluent objectives

	In Effluent	After Initial Dilution
Coliform MPN	.....	Less than 2,400 per 100 ml
Phenolics	Less than 20 ppb	Average, 2 ppb Maximum, 5 ppb
pH	5.5 to 10.6	6.7 to 8.5
Iron	17 ppm	0.3 ppm
Odor	.....	To less than 4
Oil (total) in effluent	15 ppm	.....
Floating solids	None	None
Settleable solids	None	None

design flow. These aeration tanks are followed by secondary aeration of approximately three hours in order to compensate for any short-circuiting in the primary aeration tanks and to stabilize the sludge.

After aeration, the waste is pumped to deep plastic trickling filters (Photo 4) to further reduce the phenolic compounds. The media used is Dowpac, developed by the Dow Chemical Co. The waste then goes to a chamber where part is separated for recirculation on the trickling filters and the remainder goes to the secondary clarifiers (Photo 5). Return sludge from the clarifiers is air-lifted to a splitting box where it can be divided into two streams, one for return sludge to the primary aeration tanks and the second for excess sludge to aerobic digesters.

The treated waste goes next to a holding basin. There are three of these basins, shown in the left foreground of Photo 1. Each basin can hold the design flow for a 24-hour period. If the treatment up to this point has been satisfactory, the waste is pumped to the ozone reaction tank. If it has not been satisfactory, the waste can be added to the raw waste for retreatment.

After ozonation, activated carbon is added to absorb the remaining phenolic compounds. Then comes sand filtration, the final step.

Treatment objectives were divided into two parts—those applying to the effluent directly and those applying to the effluent after initial dilution with the lake water. See Table I. The statement "after initial dilution" poses a question. If the tremendous volume of water in the lake is moving rapidly, the refinery effluent can be quickly diluted. On the other hand, if the circulation is sluggish, the concentration of contaminants can conceivably build up to unacceptable levels.

In general, at the point of effluent disposal, the lake has a circulation to the south. When the wind is from the south or east, the circulation may be stopped and even reversed. The dilution factor would be extremely small under such conditions and might be nil at certain times. The frequency of occurrence of these times was next to impossible to predict with the existing available records on the movement of the lake water.

Operation of the plant

The waste treatment plant was designed to treat an average of 360 gpm and a peak of 720 gpm. The phenolic

Photo 4. Some of the phenol reduction is accomplished in the deep plastic trickling filters utilizing Dowpac media, developed by the Dow Chemical Co.

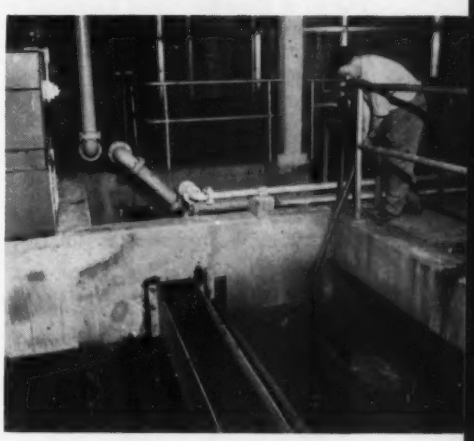


Photo 5. The effluent weirs of the secondary clarifier lead to the holding basins. The trough carries waste from the flocculator-clarifiers to the aeration tanks. The tank to the rear is an aerobic digester.

design loading was 200 lb per day, or a concentration in the waste of 47 ppm. Most of the treatment units are in duplicate so that a flow of up to 720 gpm can be treated without affecting any of the design criteria.

During the summer of 1960, a series of testing programs was conducted to profile phenolic reductions as the waste water passed from unit to unit. During the test period, the average waste-water stream from the refinery was 270 gpm. Since the refinery was operating at less than capacity at that time, the 270-gpm figure was reasonable.

At this flow the oil separators operated at removal efficiencies of from 85 to 94 percent. Oil concentrations in the waste-water streams were quite high and the oil content in the effluent of the separators was greater than expected.

The aerated equalization basin took waste-water streams that varied in phenolic concentration from 40 to peaks of over 80 ppm and leveled them out to a fairly constant feed of about 40 ppm. The other chemical characteristics of the waste-water stream were also equalized to a satisfactory level. An added function performed by the basin was that of oil removal. The equalization basin took waste-water streams having oil concentrations from 270 to 440 ppm and reduced them to between 50 and 100 ppm. This air-agitated basin was performing an excellent job as a secondary oil separator.

The flocculator-clarifier units completed oil separation. These units had been designed for a "turn-around" flow of 720 gpm and, since the flow was less than 360 gpm, only one unit was used during this testing period. The oil in the effluent was consistently less than 15 ppm. Coagulant dosage was approximately 2 grains of alum per gallon at a pH of 10.0.

The pretreatment-unit processes of gravity oil separation, equalization, and flocculation, while removing nearly all the oil, also removed a substantial part of the other contaminants, and thus lowered the load on the biological processes, as follows:

	Influent to Pretreatment	Effluent to Biological Oxidation
Phenols, ppm	40-80	40
COD, ppm	1,200-2,350	240-440
BOD, ppm	1,600	150-250

After 13 hours, the BOD of the activated sludge (because the flow was less than the design flow) was reduced from an average of 200 ppm to about 50 ppm, and the COD (chemical oxygen demand) was reduced from an average of 400 ppm to 150 ppm. In ten hours of activated-sludge treatment, the phenolics were reduced from 40 ppm to about 1 ppm or less, and after an additional three hours of aeration and passage through the Dowpac filters, the concentration was reduced to some 0.35 ppm. The BOD loading on the aeration tanks was about 23.5 lb per day per 1,000 cu ft of tank. The phenol loading was about 3.5 lb per day per 1,000 cu ft. Mixed liquor solids in aeration tanks were held at about 1,000 ppm.

The return-sludge ratio was higher than anticipated since the solids concentration from the secondary clarifiers was only 0.25 percent. No attempt has been made to increase the return-sludge concentration since the present mixed-liquor solids concentration and detention time appear to be at their optimum values.

To date, the operating results from the Dowpac filters have been inconclusive. This is probably due to the low organic loadings. The activated sludge part of the waste treatment plant precedes the Dowpac filters and this process was performing most of the job of reducing the phenolics. For a very short time during the testing period, the Dowpac filters were placed in front of the activated sludge tanks. The concentration of phenolics applied was about 43 ppm. At a hydraulic loading rate of 37 million gal per acre per day, the filter removed more than 50 percent of the applied phenolics. During this same test, the activated sludge treatment followed the filter and it further reduced the phenolics to less than 0.5 ppm.

This was not considered to be a fair test, since the slimes on the filter were acclimated to loadings of less than 1 ppm up to three to four days before the test, and then shocked with loadings of 40 ppm or greater. Management saw no reason why it was necessary to experiment with the unit processes as they were doing a better job than originally expected and, incidentally, with a minimum of attention. Experimentation, which could upset the process, could not be justified because of the public relations value of maintaining a constant effluent quality.

The holding basin following the biological oxidation phase of the treatment achieved nothing as far as treatment was concerned. In the design, its sole purpose is to provide a means of holding one day's effluent so that, if the process is upset, the stream of poor-quality waste water can be held for retreatment.

The ozone reactor performed better than expected. It took waste-water streams with phenolic concentrations between 0.16 and 0.39 ppm and oxidized them to less than 0.003 ppm or 3 ppb. The use of activated carbon for final phenolic treatment has not been required since the refinery steadied its operation. In the two months following start-up, the oil and phenolic loadings on the plant were extremely high and carbon was used at that time.

The rapid sand filter treated the effluent from the ozone reactor and removed any turbidity that might have been present. Except for a very slight color, the final effluent was clear, disinfected and fit to drink. A stream from the sand filter is adjusted in temperature and passes through the aquarium containing the lake fish. Another stream passes through a fountain on the main highway on the lake front.

Results evaluated

The waste treatment plant designed for the Trafalgar Refinery of the Cities Service Co. Ltd. of Ontario, Canada, is one of the most comprehensive plants ever conceived and constructed. Each unit process is required for a specific job and only that part of the process that is the most efficient is used. No single process could do the job required except possibly ozone. To use this process by itself would be extremely expensive, both in first and in operating costs.

The results of the treatment are indicated graphically by a comparison of the raw lake water with the final plant effluent, as measured during the testing program mentioned above.

	Raw Lake Water	Effluent
Temperature	74-90 deg F	85 deg F
pH	7.8-8.2	6.6-8.2
D.O.	6.3-8.6 ppm	4-5 ppm
Alkalinity (MO)	205 ppm	.....
Total solids	116-224 ppm	1522-1606 ppm
Settleable solids	0	0
Suspended solids	0-40 ppm	15-32 ppm
NO_3	0.43-21.6 ppm	27.0 ppm
NH_3	0.30-2.80 ppm	3.90-5.60 ppm
Phenolics	0-0.003 ppm	0.003 ppm
COD	74.5-207 ppm	127-154 ppm
BOD	0	0-8.2 ppm

With the exception of increased total solids, the effluent from the waste treatment plant is as good as the raw lake water.

It should be noted that, while process design and layout of facilities were done by Hydrotechnic, Cities Service was ably represented in consultation by Dr. John D. Frame, the company's industrial waste consultant, Mr. Joe Baum of the company's waste treatment staff, and by the technical personnel of the company, headed by Vice President Vivian Sicks.

Nomographs for area of concrete anchor blocks at pipe bends and tees

HARRY P. SCHMIDT, Research Engineer, Engineering Division, Public Works Department, U.S. Naval Ordnance Test Station, China Lake, Calif.

Frequently the civil engineer needs to calculate the radial thrust (force, in pounds) at a pipe bend. This thrust is created by the internal water pressure (psi, or head in feet) of the water flowing through the pipe. In addition the thrust is dependent on: (1) the bend or angle of the pipe created by the location requirements; and (2) the size (nominal diameter, in inches) of the piping used.

Having determined the thrust, the engineer is concerned with the support of the pipe at bends. In many cases unsupported pipe will not withstand the stresses created by the factors of head, bend, and size. Therefore concrete anchor blocks are generally used to support the pipe at bends.

This in turn makes it necessary to equate the value of the thrust found for given conditions of internal water pressure, pipe size (nominal diameter), and type of fitting (degree of bend, plug type, tee, etc.). When the soil conditions where the block is to be placed are known—and the corresponding allowable soil bearing pressure (in psf)—the area of the thrust block (in sq ft) can be obtained.

It would appear that considerable effort must be expended in computing the required areas of thrust blocks for situations affected by the five variables listed. A nomograph relating these six variables is therefore useful. Granted that effort must be expended to prepare the necessary nomograph, yet the large ultimate saving in time justifies the effort.

Such a chart, Fig. 1, will yield thrust-block areas for all pipe bends up to 90 deg, for dead ends, plugs, or caps. This chart is based on the equation,

$$125\,H\left(\frac{\pi}{4}d^2\right)\sin\frac{1}{2}\Delta = T = PA$$

in which

H = hydraulic head, ft
d = diameter of pipe, in.
Δ = pipe bend, deg
T = total radial thrust, in lb
P = internal water pressure, in psi
A = area of thrust block, in sq ft

This nomograph was developed by the writer at the request of William G. Burke, M. ASCE, Head, Civil Engineering Section, Design Branch, Engineering Division, Public Works Department, U.S. Naval Ordnance Test Station, China Lake, Calif. Since Fig. 1 is not adaptable for incorporat-

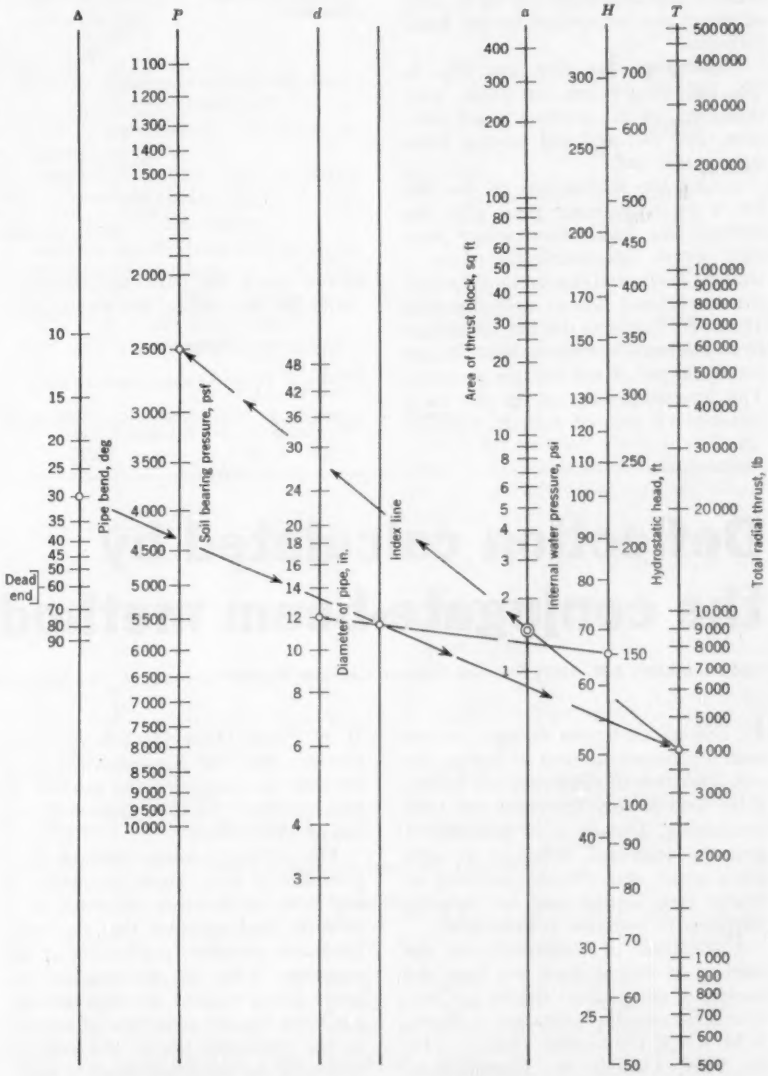


FIG. 1. Nomograph for bearing area of anchor blocks at pipe bends.

ing T-type fittings, a second nomograph, Fig. 2, was developed by Mr. Burke on the same basis to provide this information.

Sample calculations

Nomograph for pipe bends, Fig. 1. Assume the following values are given: pipe bend, 30 deg; pipe diameter, 12 in.; hydrostatic head, 150 ft; soil bearing pressure, 2,500 psf.

With a straight line, connect 12 in. on the diameter line with 150 ft on the line for hydrostatic head. This line will intersect the "index line" at some point. Connect this point with 30 deg on the pipe-bend line and extend this straight line to the line for total thrust, which is about 4,000 lb in this case. Draw a straight line between this value and 2,500 psf on the line for soil bearing pressure. This line intersects the line for thrust-block area at approximately 1.6 sq ft. The accuracy can be verified by the basic formula.

Nomograph for pipe tees, Fig. 2. The following values are given: pipe diameter, 10 in.; internal water pressure, 200 psi; and soil bearing pressure, 4,000 psf.

Locate the intersection of the line for a 10-in.-diameter pipe with the 200-psi line for internal water pressure. From this intersection draw a straight *horizontal* line cutting through the total-thrust line at approximately 16,000 lb. Continue this horizontal line to its intersection with the vertical line for 4,000 psf of soil bearing pressure. This intersection lies on the line for a thrust-block area of 4 sq ft. Computations using the basic equation will verify the accuracy of the result.

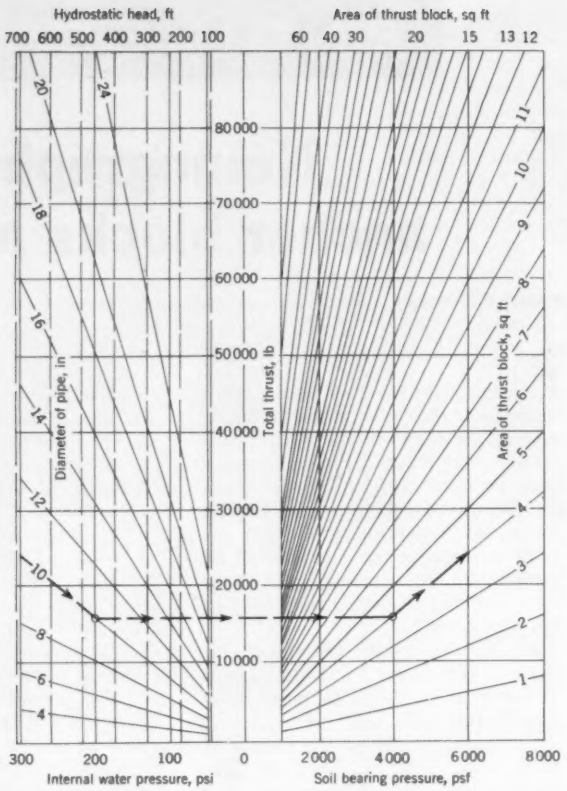


FIG. 2. Nomograph for bearing area of anchor blocks for pipe tees.

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Deflection calculated by the conjugate-beam method

JACK I. MANN, A.M. ASCE, Structural Engineer, Clarkeson Engineering Company, Inc., Boston, Mass.

In continuous beams or rigid frames with a constant moment of inertia, the determination of deflection due to uniform load is very laborious and time consuming. Usually it is required to give the dead-load deflection at each tenth point—for camber purposes in bridge steel design, and for forming purposes in concrete construction.

Calculation of deflections by the method of virtual work has been the subject of three recent articles in CIVIL ENGINEERING—by Elwood Heinz, A.M. ASCE (November 1958, p. 73); by Prof. Charles W. Cunningham, F. ASCE (March 1959, p. 61); and by H. H. Fickel (June 1960, p. 70). The first two deal with the numerical work involved in integrating the product of two functions; the third deals with the use of M-m tables.

The conjugate-beam method here presented is more easily adaptable to any type of structure subjected to a uniform load provided that the indeterminate moments are known at the supports. With this method, an exterior simple support of a real continuous beam has the same type of support as the conjugate beam. The end reaction of the conjugate beam is equal to the end slope of the deflected real beam. Since there is no deflection of the end support for the real beam, it must follow that there is no moment in the conjugate beam.

Interior supports of a real continuous beam are replaced by a hinge in the conjugate beam, and the elastic curve of the deflected real beam follows a smooth curve at the interior supports without any angular discontinuity. It follows that the algebraic sum of the left and right slopes of the deflected real beam must equal zero. Therefore the interior reaction on the conjugate beam is equal to zero.

On this basis, each individual span

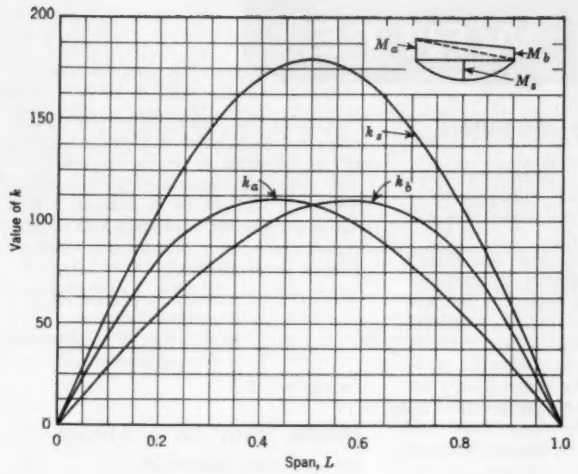


FIG. 1. Values of k_a, k_b and k_s are plotted.

of a continuous beam can be analyzed as a simple span loaded with the M/EI diagram. The graph, Fig. 1, gives values for k_a, k_b, and k_s. The basic equation is

$$\Delta_x = \frac{L^2}{EI}(M_s k_s + M_a k_a + M_b k_b + \dots) \qquad (1)$$

which gives the deflection in inches. The notation is

Δ_x = deflection

M_s = simple beam moment, in ft-kips

M_a, M_b, M_c = moments at supports, in ft-kips

L = span, in ft

E = modulus of elasticity, in ksi

I = moments of inertia, in in.^{4}

k_s, k_a, k_b, k_c = coefficients respectively for M_s, M_a, M_b, M_c

Example 1

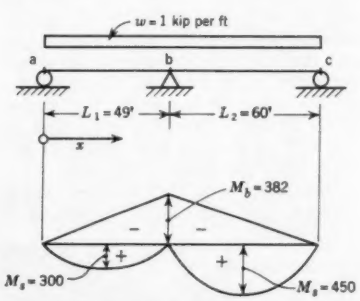
For the two-span continuous beam shown in the accompanying figure, determine the dead-load deflections at the quarter points.

Given: $E = 29 \times 10^3$ ksi; $I = 4{,}000$ in.^{4}

$$M_{s1} = 0.125 \times (49)^2 \times 1.0 = 300 \text{ ft-kips}$$

$$M_{s2} = 0.125 \times (60)^2 \times 1.0 = 450 \text{ ft-kips}$$

$M_a = M_c = 0$; $M_b = -382$ ft-kips.



Moment diagram, Example 1

By substitution in Eq. 1, the deflection is obtained in inches. The computations are given in Table I.

Example 2

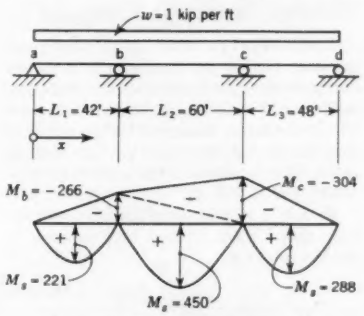
For the three-span continuous beam shown in the accompanying figure, determine the dead-load deflections at 0.2 L_2 and 0.5 L_2.

Given: $E = 3 \times 10^3$ ksi; $I = 20{,}000$ in.^{4}; $M_{s2} = 450$ ft-kips; $M_b = -262$ ft-kips; $M_c = -294$ ft-kips.

Again, by substitution in Eq. 1 the deflection is found. Here

$$\Delta_{0.2\ L2} = \frac{(60)^2}{3 \times 10^3 \times 20 \times 10^3} \times [107\,(450) + 83\,(-266) + 55\,(-304)] = 0.56 \text{ in.}$$

$$\Delta_{0.5\ L2} = \frac{(60)^2}{3 \times 10^3 \times 20 \times 10^3} \times [180\,(450) + 108\,(-266) + 108 \times (-304)] = 1.17 \text{ in.}$$



Moment diagram, Example 2

Example 3

For the rigid frame shown in the accompanying figure, determine the dead-load deflection at the midpoint. Neglect the effect of axial loads.

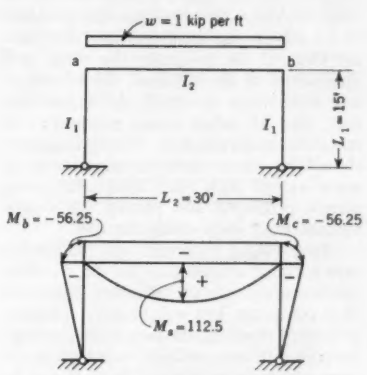
Given: $E = 29 \times 10^3$ ksi; $I_1 = I_2 = 300$ in.^{4}; $M_s = 112.5$ ft-kips; $M_b = M_c = -56.25$ ft-kips.

Again using Eq. 1, the deflection of the beam at $\frac{1}{2} L_2$ is

$$\Delta = \frac{(30)^2}{29 \times 10^3 \times 300}[180\,(112.5) + 108\,(-56.25) + 108\,(-56.25)] = 0.838 \text{ in.}$$

The deflection of the leg at $\frac{1}{2} L_1$ is

$$\Delta = \frac{(15)^2}{29 \times 10^3 \times 300}\,[108\,(-56.25)] = -0.157 \text{ in.}$$



Moment diagram, Example 3

Example 4

For a simple span where $L = 70$ ft, compute the maximum live-load deflection due to H20-S16-44 loading. Wheel distribution is 0.5 lane.

Given: Impact, 25.6 percent; $I = 18{,}000$ in.^{4}; $E = 29 \times 10^3$ ksi; $M_s = 619$ ft-kips.

To solve, use the equation

$$\Delta_x = \frac{L^2}{EI}(k_s M_s)$$

$$\therefore \frac{70^2}{29 \times 10^3 \times 18 \times 10^3}\,(180 \times 619) = 1.050 \text{ in.}$$

By the exact method, $\Delta = 0.965$ in. The error is less than 9 percent, on the conservative side.

TABLE I. Computations for Example 1

Span	Point	L^2/EI	Coefficients k_s	k_a	k_b	k_c	$k_s M_s$	$k_a M_a = k_c M_c$	$k_b M_b$	Deflection Δ, inches
L_1	¼	20.698×10^{-6}	128	0	67	0	38,400	0	−25,594	0.2651
L_1	½	"	180	0	108	0	54,000	0	−41,256	0.2638
L_1	¾	"	128	0	95	0	38,400	0	−36,290	0.0437
L_2	¼	31.034×10^{-6}	128	0	95	0	57,600	0	−36,290	0.6673
L_2	½	"	180	0	108	0	81,000	0	−41,256	1.2334
L_2	¾	"	128	0	67	0	57,600	0	−25,594	0.9933

THE READERS WRITE

Young engineers can learn much from office computers

TO THE EDITOR: As an engineering educator and as a member of the Committee on Electronic Computation of the ASCE Structural Division, I was attracted to the article, "The Electronic Computer —It Creates Problems as well as Solutions," by Donald R. Goodkind in the June 1961 issue, p. 68.

The author infers that the electronic computer might inhibit the training of young engineers. It seems to me that it is the employer's direct responsibility to see that this does not happen, that he should not just exploit young minds, but deliberately train them. Every computer program in the office library should be fully described for all users—the problem to be solved, the mathematical and logical basis of the program, the range and limitations of the solution, the nature of and restrictions on input, the output format, and all other items necessary for complete understanding. Young engineers should be encouraged to experiment to some extent with such programs, using simple problems and testing the results against their own understanding.

Many young engineers will readily accept without serious question the standard mathematical library routines employed in a computer, but will be very reluctant to accept ready-made programs for engineering problems without being given the opportunity to understand them. It may be expeditious and economical over the short range for the employer to encourage blind use of programs, but it is grossly unfair to the young engineer in terms of his own professional development, and furthermore deleterious to the long-range growth of the organization.

Young engineers these days have, in general, more mathematical ability and computer facility than their superiors and can offer these talents to their employers in trade for the wisdom of the employer's experience. Since there is no substitute for practice and experience, the young engineer must be continuously faced with analysis and design problems beyond those that are possible in an undergraduate engineering program. The digital computer in fact permits the rate of gaining such experience to be stepped up, and it is the wise employer who deliberately uses his computer as a training facility and not only as a super slide-rule to lower costs.

The digital computer has made it possible even for engineering colleges to step up the experience of the student. Moreover it is possible to crystalize his understanding of both physical and mathematical aspects of a problem through relief from the onerous but necessary computations, to sharpen his intuition through comparative solution of real problems with realistic numbers as opposed to single solutions of oversimplified problems with the numbers adjusted in advance for easy hand calculation. Students are also shown that the use of digital computers is not always appropriate, that mental calculation, slide rules, and desk calculators still have considerable merit.

I suggest, therefore, that the digital computer is not necessarily inhibiting in the training of young engineers, but can be the means of improving the judgment and imagination that mark the competent engineer. The author, in posing the problem, seems to place the responsibility for solving it largely upon the professional societies, their computer committees, and the engineering colleges, and too little on the employer himself.

It is folly for an employer, in exploiting the digital computer, to be motivated solely by the attraction of lower costs and less time. It seems short-sighted to devote all direct savings from digital computation to lowering costs and working more cheaply than one's professional competition. Conversely, it is much wiser to use some of the "savings" to up-grade and refine design to the benefit of the client and the satisfaction of the young engineer and to increase salaries of young engineers.

If, as I believe, it is the professional obligation of employers to add their wisdom of experience to the substantial ability of the new generation of engineers, then the digital computer should not be overlooked as one means to this end.

GORDON P. FISHER, F. ASCE
Associate Dean, College of Engineering, Cornell Univ.

Ithaca, N. Y.

Wanted—a trough compass

TO THE EDITOR: Can any of your readers help me? I am looking for a trough compass to replace the lost one that came with an old-model K. & E. alidade I own. The compass is described as "covering 20 deg, graduated on raised arc to half degrees. Needle about 5 in. with stop. Base about 1¾ x 7½ in."

K. & E.'s second-hand department can't help and I have written to a number of dealers in vain.

JOHN C. MADDEN

R 2, Carmel, N.Y.

Photogrammetry for modern pipeline location

TO THE EDITOR: The Association of Professional Photogrammetrists was pleased to see that the paper, "Aerial Photography Aids Pipeline Location," presented by Philip Guss at the ASCE Phoenix Convention, was published so soon after presentation (June, p. 48).

The paper exemplifies an accurate, up-to-date report on an engineering problem. This timely discussion of what photogrammetry can accomplish in pipeline location will be of value to many readers.

If you need assistance in contacting competent authors, or in evaluating articles, in the rapidly advancing field of photogrammetry, our organization will be pleased to cooperate.

JOHN H. WICKHAM, JR.
Executive Director
Association of Professional Photogrammetrists

Jenkintown, Pa.

Memo from an old-timer on public speaking

TO THE EDITOR: In my time I have attended many engineering meetings and listened to the delivery of many papers. In fact, I have delivered a goodly number myself.

If a paper is worth writing, it's worth presenting in a manner that will rivet the attention of the audience to it. This positively cannot be accomplished by reading it with eyes glued to the text and talking or mumbling monotonously into it, as is so often done.

I'm for those who deliver their papers facing the audience, with the aid of nothing more than a few reminder notes on a slip of paper or on the back of a calling card in hand. If such a one has lantern slides, he still faces the audience, and does not mumble to the screen; he points them out and then turns and talks.

"Speak the speech, I pray you, as I pronounced it to you, trippingly on the tongue; but if you mouth it, as many of your players do, I had as lief the town crier spoke my lines."—Shakespeare

Also, let us all pronounce common words correctly.

J. C. STEVENS,
Past President, ASCE
Consulting Hydraulic Engr.
Stevens & Thompson Engrs.

Portland, Oreg.

Variety of subject matter in "Civil Engineering" praised

TO THE EDITOR: CIVIL ENGINEERING is a very good all-round magazine covering a great variety of subjects. This is fine the way it is. Each individual has specific interests and naturally follows those articles that best suit his interests; so to ask for more in any one field would specialize the magazine too much. If a person wants further information in his field, he can look to journals that emphasize that field more particularly. But keep CIVIL ENGINEERING as is. Then everyone will be pleased. You can't cover everything in one periodical.

J. C. TURNER, A.M. ASCE
Design Engr. (Structural)
J. H. Pomeroy Company

San Francisco, Calif.

Vertical stress beneath a footing

TO THE EDITOR: An error in my Engineers' Notebook article, "Determining Vertical Stress Beneath a Footing" (June 1961, p. 71), has been brought to my attention. Example 2 shows a 6-ft x 8-ft footing being divided into 6 x 6-ft and 2 x 8-ft footings whereas it should have been divided into 6 x 6-ft and 2 x 6-ft footings.

The equivalent width of the 2 x 6-ft footing is 3.46 ft, and the distance from its center to the point in question is $\sqrt{6^2 + 4^2} = 7.21$ ft. The distance from the center of the 6 x 6-ft footing to the point in question is $\sqrt{2^2 + 4^2} = 4.47$ ft.

Relate these distances to the footing widths, B, and enter the chart with horizontal distances of $7.21 \div 3.46 = 2.08$ B and $4.47 \div 6 = 0.74$ B respectively. Corresponding vertical distances are $10 \div 3.46 = 2.89$ B and $10 \div 6 = 1.67$ B.

The influence value for the 2 x 6-ft portion of the footing is then about 0.01. The influence value for the 6 x 6-ft portion is about 0.07. Adding these values together and multiplying by the bearing pressure of the footing (0.08 x 2,500 psf) produces an answer of 200 psf for the vertical stress at the point in question.

R. ALAN BERGGREN, A.M. ASCE
Field Engineer
New York Central Railroad
Chicago, Ill.

"Delta girders" have been built for bridges in Europe

TO THE EDITOR: The tests on a "delta girder" reported by Homer M. Hadley in the May issue, p. 50, are valuable but the shape is not new.

The forerunner of the "delta girder" was the delta flange angle shown in Fig. 1. Angles, about 4 x 4 in., were positioned in the manner shown on a continuous,

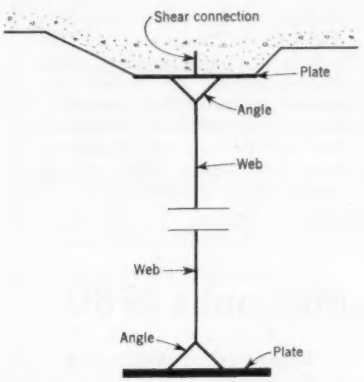


FIG. 1. Girder section for Aare River Bridge, built in Olten, Switzerland, in 1950.

composite single-track railway bridge built in Switzerland in 1950. The structure has three 118.1-ft spans (*Der Bauingenieur,* 1950, p. 309). Such angles (about 8 by 8 in.) were shown on the plans of a through single-track railroad bridge with open timber floor for a 75.46-ft span built in Germany in 1952. In this bridge, corrosion resistance was the reason for the use of delta-positioned flange angles (*Der Stahlbau,* 1952, p. 90).

It would seem that the first application of wide-flange stiffening by means of an inclined plate forming a closed box section with the flange and web occurred in the writer's all-welded alternate design for a swing span 137 ft long. Submitted to the Corps of Engineers in 1951, the steel floor of this bridge acted as the top flange of two plate girders. The bottom flanges had a constant thickness of ¾ in. and were stiffened by inclined plates ⅜ in. thick, as shown in Fig. 2. This bridge was to be a partially experimental structure; it contained little more than half the steel in a conventional design.

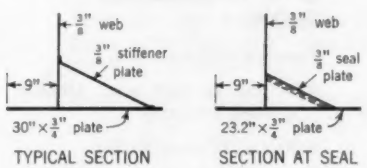


FIG. 2. Bottom flange sections for a projected swing span.

Of similar proportions to the "delta girder" in the test reported by Mr. Hadley are the girders in the single-track composite railway bridge shown in Fig. 3, built in Wymeer-Tief, Germany, in 1951 (*Die Bautechnik,* 1952, p. 166).

Five continuous north approach spans, and a 134-ft south approach span, of the Elbe River Bridge, built in Lauenburg, Germany, in 1952, have through "delta girders" 9.5 ft deep on the railway side and 6.3 ft deep on the highway side. The plates, inclined at an angle of 45 deg, are 9.06 in. wide at both the top and the bottom flanges of both girders. Torsional stiffness, three-line support of cover plates, increased rigidity against buckling, a saving in steel in the restrained web, and corrosion resistance—all these were listed as the reasons for using "delta girders" in this bridge (*Der Stahlbau,* 1952, p. 92).

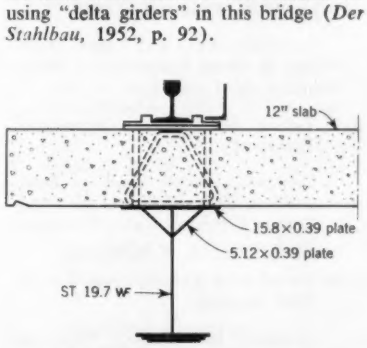


FIG. 3. Girder section for Wymeer-Tief single-track railroad bridge, of 36-ft span, built in Germany in 1951. Inclined plates reach below the ¼ depth.

The Weser River Bridge, Porta, Germany, built in 1954, consists of a three-span continuous box-plate girder 813 ft long, one end span of which is 348.52 ft long and has a constant de-th of $l/31$. The "delta" arrangement of the girders of this bridge is shown in Fig. 4 (*Der Stahlbau,* 1955, p. 97).

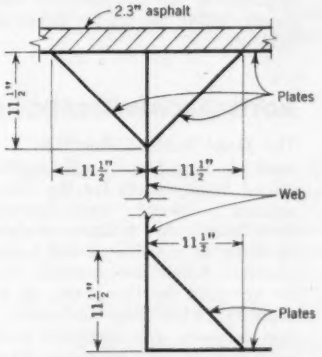


FIG. 4. Girder section for Weser River Bridge, built in Porta, Germany, in 1954.

Two through single-track railroad bridges side by side in Obereving, Germany, built in 1955, contain four three-span continuous "delta girders" 285 ft long and 4.8 ft deep. The 45-deg inclined plates extend the full width of the 15-in.-wide cover plates top and bottom (*Der Stahlbau,* 1955, p. 151).

Evidently, the "delta" arrangement can result in a variety of advantages, both economic and structural. Research proposed ten years ago would have paid its cost immediately and many times over since that time in advantageous applications of the "delta" principle. Other useful plate combinations have been developed in the intervening years. The traditional situation whereby practical applications are one or more decades behind available knowledge should be terminated by the introduction of free opportunity in the design of all publicly financed bridges.

LOUIS BALOG
Consulting Engineer
Binghamton, N.Y.

AMERICAN SOCIETY OF CIVIL ENGINEERS

1961 Annual Convention
and
Civil Engineering Show

Headquarters: Hotel Statler-Hilton, New York, N.Y. **October 16-20, 1961**

REGISTRATION

Southwest Corner, Exposition Hall, Mezzanine, Hotel Statler-Hilton

Opens Sunday, Oct. 15, 2:00 to 5:00 p.m.

Monday, Oct. 16 through Thursday, 8:00 a.m. to 5:00 p.m.

Friday, Oct. 20, 8:00 a.m. to 1:00 p.m.

Registration fee for members and guests: $5.00. No fee for ladies or students.

HOTEL ACCOMMODATIONS

The Hotel Statler-Hilton, 7th Avenue at 33rd Street, will be the official headquarters for the Convention. Special arrangements have been made to accommodate as many as possible at the headquarters hotel. Reservations will be accepted by the hotel, up to capacity, in the order that reservation requests are received. Send your request early to assure space at the headquarters hotel. For your convenience, a request form is provided on page 135.

CONDITIONS OF PRACTICE SESSIONS

It is to be noted that sessions sponsored by the Department of Conditions of Practice are scheduled at 11:00 a.m. on Monday, Tuesday, Thursday and Friday. All Technical Division Sessions will terminate by 11:00 in order to encourage attendance at the COP sessions.

INFORMATION AND REGISTRATION

Information and registration facilities will be maintained on the mezzanine floor throughout each Convention day. Mail and messages will be held for members at the information desk. Announcements seeking individuals will not be made in sessions of the Convention.

CIVIL ENGINEERING SHOW

Exposition Hall, Mezzanine

9:00 a.m. to 6:00 p.m., Monday through Thursday

9:00 a.m. to noon, Friday

Firms supplying materials, equipment and services used in the various fields of civil engineering will participate in the Fifth Annual Civil Engineering Show. The exhibit will afford an opportunity to observe at first hand the latest developments available to the practicing engineer.

STUDENTS' HOSPITALITY ROOM

Hartford Room

Sunday, Oct. 15 12:00 noon to 5:00 p.m.

Monday, Oct. 16 9:00 a.m. to 5:00 p.m.

Tuesday, Oct. 17 9 a.m. to 2:00 p.m.

Students of the Metropolitan Student Chapter Conference will play host to all visiting students in the student lounge. All students are invited to make this Hospitality Room their informal "headquarters" and to come to relax and to meet new friends. Light refreshments will be available.

Convention Theme: Metroplis 1980

MONDAY MORNING

OCT. 16

Air Transport Division

9:00 a.m.

9:00 Transcontinental and Intercontinental Air Transport of 1980

R. DIXON SPEAS and LEROY SIMPSON, R. Dixon Speas Assocs., Manhasset, L. I., N. Y.

9:30 Future Short-Range Commercial Transport

DAVID C. HAZEN, Dept. of Aeronautical Eng., Forrestal Research Center, Princeton Univ., Princeton, N. J.

10:00 Paved-Area Requirements for the 1980 Aircraft

ROBERT HORONJEFF, Prof. of Transportation Eng., and Research Engr., Inst. of Transportation and Traffic Eng., Univ. of California, Richmond.

Engineering Mechanics Division

9:00 a.m.

Presiding: Merit P. White, Member, Exec. Committee

Structural Dynamics

9:00 Rayleigh Wave Effects Due to a Nuclear Blast on an Elastic Half-space

M. L. BARON, Chief Engr., Paul Weidlinger Assocs., New York, and C. LECHT, Lt., U. S. Army Ordnance, Industrial Data Agency, Snowville, Va.

9:40 Static and Dynamic Tests of Portal-Frame Knee Connections

WARREN A. SHAW, Structural Research Engr., U. S. Naval Eng. Lab., Port Hueneme, Calif.

10:15 Dynamic Response of Continuous Highway Bridges

TSENG HUANG and A. S. VELETSOS, Prof., Civil Eng., Univ. of Illinois, Urbana.

City Planning Division

9:00 a.m.

9:00 A Planning Approach to Urban Renewal

JAMES FELT, Chairman, New York City Planning Commission, Dept. of City Planning, New York, N. Y.

9:30 The Urban Renewal Program in New York City

J. CLARENCE DAVIES, JR., Chairman, Housing and Redevelopment Board, New York, N. Y.

10:00 The Charles Center Project

DAVID WALLACE, Prof., Univ. of Pennsylvania, Philadelphia, Pa.

10:30 The Engineer's Role in Planning Urban Renewal

JAMES W. FOLLIN, Consulting Engr., Washington, D. C.

Sanitary Engineering Division

9:00 a.m.

9:00 Report on Research Needs

NELSON L. NEMEROW, Prof., Civil Eng. Dept., Syracuse Univ., Syracuse, N. Y.

9:30 Report on Air Pollution

WILLIAM T. INGRAM, Consulting Engr., Whitestone, N. Y.

10:00 Food Waste Disposers

K. S. WATSON, General Electric Co., Schenectady, N. Y.

Waterways and Harbors and Construction Divisions

9:00 a.m.

Presiding: Evan W. Vaughan, Vice Chairman, Exec. Committee, Waterways and Harbors Div.; and William P. Kinneman, Member, Committee on Session Programs, Construction Div.

9:00 Reconstruction of No. 3 Drydock at Portsmouth Naval Shipyard

W. R. BOYER, CEC, First Naval District, Boston, Mass.

9:45 Construction of Bremerton Supercarrier Drydock

THOMAS TATE, CEC, Puget Sound Naval Shipyard, Bremerton, Wash.

10:15 The Construction of the Port of Ashdod, Israel

CHRISTOPHER J. MURPHY, Vice President, Frederick R. Harris, Inc., New York, N. Y.

Department of Conditions of Practice

11:00 a.m. Georgian Room

Session by Committee on Younger Members

Panel discussions on Professional Responsibilities of the Employer and the Employee to Each Other

Moderator: JOHN E. HEINZERLING, Pittsburgh, Pa.

What Can the Employer Do to Help the Employee Grow in Stature and Worth as a Professional Engineer?

Panel members: NOMER GRAY, Partner, Ammann & Whitney, New York, N. Y.

CHARLES M. DUKE, District Engr., U. S. Army Eng. Dist., New York, N. Y.

What Can the Employee Do to Improve His Value as a Young Engineer to the Employer?

Panel members: DONALD KOWTKO, Cost Engr., Esso Research & Eng. Co., Linden, N. J.

EDWARD S. PLOTKIN, Civil Engr., Naval Public Works, New York, N. Y.

GENERAL MEMBERSHIP LUNCHEON

Monday, Oct. 16

12:30 p.m. Terrace Ballroom

Presiding: GLENN W. HOLCOMB, President, ASCE

Toastmaster: GARDNER M. REYNOLDS, General Chairman, New York Annual Convention Committee, and President, Metropolitan Section, ASCE

Speaker: ROBERT C. WEAVER, Administrator of the Housing and Home Finance Agency, Washington, D. C.

Subject: Metropolis 1980—Urban Renewal.

All members and guests of the Society are invited to attend. Tickets are available until 11:00 a.m. Monday.

Per plate, $5.50.

MONDAY AFTERNOON

OCT. 16

Student Chapter Conference

Monday, Oct. 16, 2:30 p.m.

Panel program: The Professional Opportunities for Civil Engineers in New Fields.

Participating: WILLIAM WHIPPLE, Chief Engineer, New York World's Fair 1964-5 Corp.

(See final program for other panel participants.)

Air Transport Division

2:30 p.m.

Terminal Building Facilities

2:30 Rebuilding Today's Pavements for Tomorrow's Aircraft

RON HUTCHINSON and SHUG WATHEN, Pavement Div., Ohio River Div. Labs., U. S. Army Corps of Engrs., Cincinnati, Ohio.

3:00 Adapting Today's Terminals for Tomorrow's Traffic

JOHN P. VEERLING, Chief, Aviation Planning Div., Port of New York Authority, New York, N. Y.

3:30 Impact of Vehicular Traffic on Air Terminal Facilities

NORMAN L. JOHNSON, Chief, Forecast and Analysis Div., Aviation Dept., Port of New York Authority, New York, N. Y.

City Planning Division

2:30 p.m.

2:30 Zoning Advances in New York City

LAWRENCE M. ORTON, Commissioner, City Planning Commission, New York, N. Y.

3:00 New Concepts in Zoning

JACK C. SMITH, Chief, Office of Master Planning, Dept. of City Planning, New York, N. Y.

3:30 An Appraisal of Zoning as a City Planning Tool

RICHARD F. BABCOCK, Attorney, Ross, McGowan & O'Keefe, Chicago, Ill.

Engineering Mechanics Division

2:30 p.m.

Presiding: W. J. Hall, Chairman, and R. M. Haythornthwaite, Member, Committee on Plasticity

Plasticity

2:30 The Post-Buckling Strength of Wide-Flange Beams

G. C. LEE, Research Asst., and T. V. GALAMBOS, Asst. Prof., Research, Fritz Eng. Lab., Lehigh Univ., Bethlehem, Pa.

3:00 Analysis of Frames Loaded into the Plastic Range

M. OJALVO, Prof., Dept. of Civil

Eng., Ohio State Univ., Columbus, and L. W. Lu, Research Asst., Fritz Eng. Lab., Lehigh Univ., Bethlehem, Pa.

3:30 Experiment and Theory on Yielding at Varying Load Rates

A. M. DiGioia, E. D. Appolonia, Assocs., Pittsburgh, and R. G. Crum, Space Systems Operations, Aeronutronics Div. of Ford Motor Co., Newport Beach, Calif.

4:00 Range of the Yield Condition in Stable, Ideally Plastic Solids

R. M. Haythornwaite, Prof of Eng. Sciences, Univ. of Mich., Ann Arbor.

Sanitary Engineering Division

2:30 p.m.

Stream Pollution Analysis

2:30 Pollution Assimilation Capacity of Streams and Estuaries

Donald O'Connor, Prof., Manhattan College, New York, N. Y.

3:00 Prediction of Stream Reaeration Rates

Milo A. Churchill, Tennessee Valley Authority, Chattanooga, Tenn.

Structural and Construction Divisions

2:30 p.m.

Presiding: John D. Haltiwanger, Secretary, Exec. Committee, Structural Div.; and William O. Hiltabidle, Chairman, Committee on Session Programs, Construction Div.

2:30 Construction of Pan American Building

James Ruderman, Consulting Engr., New York, N.Y.

3:30 Barrington Plaza Complex

James Kesler, Chief Structural Engr., Daniel, Mann, Johnson & Mendenhall, Los Angeles, Calif.

4:30 The World's Most Powerful Radio Facility

Norman Magneson, CEC, USN, Officer in Charge of Construction, USN YLF Communication Facility, Arlington, Va.

Waterways and Harbors Division

2:30 p.m.

Presiding: Evan W. Vaughan, Vice Chairman, Exec. Committee

Session of Committee on Regulation and Stabilization of Rivers

2:30 Stabilization Works on the Savannah River below Augusta, Ga.

William J. Wall, U. S. Army Engr. District, Savannah, Ga.

3:15 Water-Control Structures in the Central and Southern Florida Flood Control Project as Channel Stabilization Features

Theodore A. Abeln and Wilbert S. Eisenberg, Hydraulic Engrs., U. S. Army Engr. District, Jacksonville, Fla.

3:45 Quality Regulation of Streams

Sylvan C. Martin, Regional Engr., U. S. Public Health Service, New York, N. Y.

4:30 Side-Cast (Boom) Dredging—Foreign Experience and Domestic Application

Henry G. A. Hayward, Chief, Marine Div., and Chairman, Hopper Dredge Board, U. S. Army Engr. Div., North Atlantic.

ICEBREAKER PARTY

Monday, Oct. 16

5:30 to 7:00 p.m. Ballroom

The Metropolitan Section will be host at this first general gathering of the Convention which is open, without charge, to those who have paid the registration fee and their wives. An ideal opportunity to greet old friends and new with cocktails. Your badge will serve as your ticket for this affair.

TUESDAY MORNING

OCT. 17

Air Transport Division

9:00 a.m.

Future of Aviation

9:00 Future of Air Freight

Stanley H. Brewer, Prof., Univ. of Seattle, Seattle, Wash.

10:00 Future of General Aviation

George R. Borsari, Chief, Airports Div., Bureau of Facilities and Material, Federal Aviation Agency, Washington, D. C.

Construction Division

9:00 a.m.

Presiding: Joseph F. Jelley, Chairman, and Lyman D. Wilbur, Member, Exec. Committee

9:00 Narrows Bridge Foundation

Eugene G. Rau, Chief Engr., J. Rich Steers, Inc., New York, N. Y.

9:30 Chesapeake Bay Bridge-Tunnel Construction

John. W. Fowler, Tidewater-Raymond-Kiewit, Bayside, Va.

10:00 Pretest Rock Anchors for Tying Back Sheeting for Deep Excavations

Robert E. White, Chief Engr., Spencer, White & Prentis, Inc., New York, N. Y.

Sanitary Engineering Division

9:00 a.m.

Complete Oxidation Waste Treatment Plants

9:00 Mathematics of Extended Aeration Systems

Ross E. McKenney and R. C. Doshe, Professors, Univ. of Kansas, Lawrence.

9:30 Our Experiences Concerning Small Total Oxidation

Ralph H. Baker, Jr., Florida State Board of Health, Jacksonville, Fla.

10:00 Extended Aeration System

Fred W. Eckenfelder, Manhattan College, New York, N. Y.

Structural and Engineering Mechanics Divisions

9:00 a.m.

Presiding: Robert D. Dewell, Member, Exec. Committee, Structural Div.; and Clyde E. Kesler, Member, Committee on Mechanical Properties of Materials, Engineering Mechanics Div.

Teaching of Materials in Civil Engineering

9:00 Significant Aspects of Materials Behavior

J. M. Frankland, Consultant, Eng. Mechanics Sect., National Bur. of Standards, Washington, D. C.

10:00 Mechanical Behavior of Engineering Materials

Joseph Marin, Prof., College of Eng., Pennsylvania State Univ., University Park, Pa.

10:20 Structural Design as a Pattern for Material Instruction

Lawrence H. Van Vlack, Prof. of Materials Eng., Univ. of Michigan, Ann Arbor.

10:40 Mechanical Behavior of Solids

Herbert T. Corten, Prof. of Theoretical and Applied Mechs., Univ. of Ill., Urbana.

Waterways and Harbors Division

9:00 a.m.

Presiding: Evan W. Vaughan, Vice Chairman, Exec. Committee

Session of Committee on Coastal Engineering

9:00 Fixed Bypassing Plant, Fire Island Inlet, Long Island, New York

FREDERICK H. DECHANT, Consulting Engr., Harris-Dechant Assocs., Philadelphia, Pa.

9:30 Equilibrium Profiles of Sand Beaches in the Offshore Zone

PETER S. EAGLESON, Prof., Hydrodynamics Lab., Mass. Inst. of Technology, Cambridge; and B. GLENNE, Univ. of Colorado, Boulder.

10:00 Hurricane Studies of New York Harbor

FRANK L. PANUZIO and SAMUEL GOFSEYEFF, U. S. Army Engineer Dist., New York, N. Y.

10:30 Mechanical Bypassing of Littoral Drift at Coastal Inlets

GEORGE M. WATTS, Asst. Chief, Eng. Div., Beach Erosion Board, Washington, D. C.

Department of Conditions of Practice

11:00 a.m. Ballroom

Sponsored by the Committee on Engineers in Public Practice

Presiding: FRANK A. BUTRICO, Vice-Chairman, Committee on Engineers in Public Practice

What Must Be Done to Recruit and Keep Top Flight Engineers in Public Practice?

C. MANSEL KEENE, Civil Service Commission, Washington, D.C.

PAUL R. SCREVANE, Deputy Mayor, New York, N. Y.

TUESDAY AFTERNOON

OCT. 17

City Planning, Highway, and Air Transport Divisions

2:30 p.m.

2:30 Ground Transportation Time as a Factor in Air Travel

REGINALD J. SUTHERLAND, Director, Facilities Eng., American Airlines, Inc., New York, N. Y.

3:00 Airport Access and the Highway System

WILLIAM J. MORTIMER, Supt. of Highways, Cook County, Chicago.

GENERAL MEMBERSHIP LUNCHEON

Tuesday, Oct. 17

12:30 p.m. Georgian Room

Presiding: GLENN W. HOLCOMB, President, ASCE

Toastmaster: LAWRENCE A. ELSENER, Vice President, Zone IV, ASCE, and Chairman, Committee on Conditions of Practice.

Speaker: SAMUEL S. BAXTER, Water Commissioner and Chief Engr., Water Dept., Philadelphia, Pa.

Subject: Metropolis 1980—Utilities

All membes and guests of the Society are invited to attend. Tickets are available until 10:00 a.m. Tuesday.

Per plate, $5.50.

3:30 Airport Location in Relation to Urban Transportation

RICHARD H. JORDAN, Research Engr., Dept. of Transportation Eng., Univ. of California, Richmond.

Construction Division

2:30 p.m.

Presiding: Carl B. Jansen, Vice Chairman, and Dwight W. Winkelman, Member, Exec. Committee

2:30 Meeting Foreign Competition in Construction

GERRY A. O'CONNOR, Raymond International, Inc., New York, N. Y.

3:15 Terminal Construction at the Miami International Airport

GEORGE SMITH, Howard, Needles, Tammen & Bergendoff, Miami, Fla.

4:00 Engineering and Construction in Western Europe by the U.S. Army Construction Agency, France

WARREN S. EVERETT, Dist. Engr., U.S. Army Engr. Dist., Vicksburg, Miss.

Sanitary Engineering Division

2:30 p.m.

Water Works

2:30 Simplified Water Filtration Plant Design

VANCE C. LISCHER, Horner and Shifrin, St. Louis, Mo.

3:00 Variable-Rate Filtration

H. E. HUDSON, JR., Hazen and Sawyer, New York, N. Y.

3:30 The Statistical Theory of Queues Applied to the Design of Impounding Reservoirs

HAROLD A. THOMAS, Prof., Harvard Univ., Cambridge, Mass.; and GEORGE BRYANT, Prof., Mass. Inst. of Tech., Cambridge, Mass.

4:00 Reservoir Mass Analysis by a Low-Flow Recurrence Series

J. B. STALL, State Water Survey Div., Urbana, Ill.

Structural and Engineering Mechanics Divisions

2:30 p.m.

Presiding: Nathan D. Whitman, Jr., Vice Chairman, Exec. Committee, Structural Div.; and John E. Goldberg, Chairman, Committee on Mathematical Methods, Engineering Mechanics Div.

Reappraisal of Analog Computation

2:30 What is an Analog Computer?

M. A. BRULL, Univ. of Pennsylvania, Univ. Park, Pa.

3:00 Passive Analog Computers for Structural Analysis

R. H. MACNEAL, Computer Eng. Assocs., Inc., Pasadena, Calif.

3:45 Active Analog Computers for Structural and Engineering Mechanics Problems

ROBERT HOWE, Prof., Univ. of Michigan, Ann Arbor

4:20 Panel discussion

Waterways and Harbors Division

2:30 p.m.

Presiding: Evan W. Vaughan, Vice Chairman, Exec. Committee

Session of Committee on Flood Control and Navigation Facilities

2:30 Estimating Low Flows from Ungaged Areas

WALTER T. WILSON, U. S. Study Commission, Southeast River Basins, Atlanta, Ga.

3:00 The World Bank Activities as Related to the Water Resources Field

RALPH L. BLOOR, Internat'l Bank for Reconstruction and Development, Washington, D. C.

3:30 Isthmian Canal Studies

S. C. HOLLISTER, Dean of Eng., Cornell Univ., Ithaca, N. Y.

4:00 Locks Overhaul, the Panama Canal

W. A. CARTER, Governor of the Canal Zone; and ROBERT D.

BROWN, JR., Director, Eng. and Constr. Bur., Panama Canal Co., Canal Zone.

HARBOR TOUR AROUND MANHATTAN ISLAND

Tuesday, Oct. 17

Boat will leave West 42nd Street and Hudson River at 2:30 p.m. and return to pier at 5:30 p.m.

Boat trip around Manhattan Island will encompass luxury liner piers, City of New York Department of Marine and Aviation; piers under construction; Brooklyn piers of the Port of N. Y. Authority; United Nations Center; United Engineering Center; site of World Trade Center development; construction of second deck of the George Washington Bridge; Hoboken piers of the Port of N. Y. Authority; Narrows Bridge site; and commentary throughout the trip on points of interest in the harbor.

Light refreshments will be served on the boat. There will be no charge for the trip.

Commentary during the trip will be provided by representatives of the Port of New York Authority and the City of New York Department of Marine and Aviation.

CONSULTING ENGINEERS' DINNER

Tuesday, Oct. 17
The Waldorf-Astoria Hotel

Annual Dinner of the American Institute of Consulting Engineers

6:30 p.m. Cocktails in Empire Room

7:15 p.m. Dinner in Sert Room

Presiding: GERALD T. MCCARTHY, President, American Institute of Consulting Engineers

Award of Merit

Recipient: MONROE JACKSON RATHBONE, President, Standard Oil Co. (New Jersey), New York, N. Y.

Speaker: LEE A. DUBRIDGE, President, Calif. Inst. of Tech., Pasadena, Calif.

Per person, $20.00, including cocktails.

Engineers who wish to attend should address inquiries to the American Institute of Consulting Engineers, 345 East 47th Street, New York 17, N. Y.

WEDNESDAY MORNING

OCT. 18

ECPD INSPECTORS' BREAKFAST

Wednesday, Oct. 18

7:30 a.m. **Dartmouth Room**

Annual Business Meeting of ASCE

9:00 a.m. **Georgian Room**

9:00 Annual reports

By the President
By the Executive Secretary

9:30 Presentation of Awards

10:30 Installation of Officers

11:00 President's Inaugural Address

AWARDS LUNCHEON

Wednesday, Oct. 18

12:30 p.m. **Ballroom**

Presiding: Incoming President, ASCE

Toastmaster: ROGER H. GILMAN, Director, District 1, ASCE

Speaker: AUSTIN J. TOBIN, Executive Director, The Port of New York Authority

Subject: Metropolis 1980—Mass Transportation

Presentation of Honorary Membership to:

SAMUEL B. MORRIS, Engineer and Educator, Los Angeles, Calif.

GEORGE S. RICHARDSON, Consulting Engr., Pittsburgh, Pa.

THORNDIKE SAVILLE, Engineering Educator, Gainesville, Fla.

ABEL WOLMAN, Engineering Educator, Baltimore, Md.

All members and guests of the Society and their wives are cordially invited to attend this event. Tickets available until 11:00 a.m. Wednesday.

Per plate, $5.75.

WEDNESDAY AFTERNOON

OCT. 18

Highway Division

2:30 p.m.

Presiding: John O. Morton, Member, Exec. Committee

2:30 Correlation of Vehicle Design and Highways for the Future

KENNETH A. STONEX, Asst. Director, General Motors Proving Grounds, Milford, Mich.

3:00 Interchanges and Ramps—New Concepts for Urban Freeways: a symposium

ROY W. MORSE, City Engr., Seattle, Wash.

ROGER F. NUSBAUM, Deputy Chief Engr., Div. of Highways, State of Illinois, Chicago.

DON W. LOUTZENHEISER, Chief, Highway Design Div., U. S. Bur. of Public Roads, Washington, D. C.

Hydraulics and Waterways and Harbors Divisions

2:30 p.m.

Presiding: Arno T. Lenz, Secretary, Exec. Committee, Hydraulics Div.; Thorndike Saville, Jr., Chairman, Committee on Coastal Eng., Waterways and Harbors Div.; and W. Douglas Baines, Member, Committee on Hydromechanics, Hydraulics Div.

Co-sponsored by Committee on Coastal Eng., Waterways and Harbors Div., and Committee on Hydromechanics, Hydraulics Div.

2:30 A Theory of Wave Agitation in a Harbor

B. LEMEHAUTE, Dept. of Civil Eng., Queen's Univ., Kingston, Ont., Canada

3:10 Wave-Induced Harbor Oscillations

FREDERICK RAICHLEN and ARTHUR T. IPPEN, Hydrodynamics Lab., Mass. Inst. of Tech., Cambridge.

3:45 The Use of Bernoulli's Equation in Wave Theory

CHARLES L. BRETSCHNEIDER, Beach Erosion Board, U. S. Army, Washington, D. C.

4:25 Diffraction of Waves by a Semi-Infinite Breakwater

R. L. WEIGEL, Inst. of Eng. Research, Univ. of California, Berkeley.

Power Division

2:30 p.m.

Presiding: Marcel P. Aillery, Chairman, Exec. Committee

2:30 Project EHV—Towers and Foundations for Extra-High-Voltage Transmission Line

PHILIP A. WILD, Civil Engr., and E. F. HASLAM, JR., Stone & Webster Eng. Corp., Boston, Mass.

3:30 The Peixota-Furnas-Belo Horizonte 345/400-kv Line, South America's First EHV Transmission Line

ARTHUR G. VILLEPIQUE, Civil Engr., Ebasco Services, Inc., New York, N. Y.

4:00 Design of Extra-High-Voltage Steel-Tower Transmission Lines, Niagara Adirondack Tie Line

W. O. PETERSEN, Civil Engr., Chas. T. Main, Inc., Boston, Mass.

Structural Division

2:30 p.m.

Presiding: Emerson J. Ruble, Chairman, Exec. Committee

Research Session

A group of short papers will be presented on new research techniques and current developments in important structural research programs.

The complete program for this session will be published as a part of the final convention program.

Surveying and Mapping Division

2:30 p.m.

Design Surveys

2:30 Chesapeake Bay Bridge Tunnel Survey

P. Z. MICHENER, Principal Engr.; and E. O. HEATON, (U.S.C.& G.S., ret.) Survey Chief, Sverdrup & Parcel, St. Louis, Mo.

3:00 Photogrammetric Survey Costs

JOHN H. WICKHAM, JR., Exec. Director, Assoc. of Professional Photogrammetrists, Jenkintown, Pa.

3:30 Right-of-Way Plans and Maps—Difficulties and Variations

FRANK BONACCI, Survey Office Manager, Lockwood, Kessler & Bartlett, Syosset, L. I., N. Y.

THURSDAY MORNING

OCT. 19

Hydraulics Division

9:00 a.m.

Presiding: Arno T. Lenz, Secretary, Exec. Committee; and Alvin J. Peterka, Member, Committee on Hydraulic Structures

Hydraulic Structures

9:00 Design and Operating Problems on the Glendo Dam High-Head Outlet-Works Stilling Basin

M. A. JABARA and W. E. WAGNER, Bur. of Reclamation, Denver, Colo.

DINNER-DANCE AND RECEPTION

Wednesday, Oct. 18 Ballroom Suite

6:30 p.m. Assembly and cocktails in Ballroom Rotunda

Cocktails provided through the hospitality of the Metropolitan Section, ASCE

7:30 p.m. Dinner in Ballroom

9:00 p.m. Reception by President and Honorary Members in East Room

9:00 p.m. Dancing in Ballroom

10:00 p.m. Special entertainment

For this social evening, special reservations can be made for tables seating 10 persons each. Members may underwrite complete tables, or pool reservations with others.

The published seating list will close at 2:00 p.m., Tuesday, Oct. 17. Tickets purchased after that hour will be assigned to tables in order of purchase. Sale of tickets will be limited to the capacity of the Ballroom.

Dinner dress (black tie). Per plate, $12.50.

Mail orders for tables must be accompanied by a check in full, payable to the American Society of Civil Engineers, and a list of guests. Send order and checks to:

American Society of Civil Engineers, United Eng. Center
345 East 47th Street
New York 17, N. Y.

9:40 New Approach to Design of Side Channel Spillways

H. S. FARNEY, U. S. Army Engr. Dist., Kansas City, Mo.; and ADOLPHUS MARKUS, U. S. Army Engr. Dist., Omaha, Nebr.

10:20 Prototype Experience with Energy Dissipators

R. H. BERRYHILL, Asst. Chief, Eng. Div., U. S. Army Engr. Dist., Fort Worth, Tex.

Highway Division

9:00 a.m.

Presiding: Walter H. Tacke, Member, Exec. Committee

9:00 Highway Cost and Financial Planning for the Future

ROY E. JORGENSEN, Roy E. Jorgensen & Assocs., Highway Management Consultants, Washington, D. C.

9:30 Urban Transportation Requirements for Movement of People—Envisaged for World's Fair

WILLIAM E. POTTER, Exec. Vice President, World's Fair Corp., Flushing, N. Y.

10:00 What's Ahead After 1975?

WILLIAM A BUGGE, Director of Highways, Wash. State Highway Commission, Olympia, Wash.

10:30 Automatic Highways—Future Possibilities

ALBERT A. ATWELL, Transportation Policy Group, Washington, D. C.

Power Division

9:00 a.m.

Presiding: A. J. Michael, Member, Committee on Session Programs

9:00 General Civil Engineering Features of Indian Point Atomic Power Plant

T. R. GALLOWAY, Chief Structural Engr., Consolidated Edison Co., New York, N. Y.

9:30 Internal Construction, Containment and Shielding for Indian Power Atomic Power Plant

LYLE V. LARSEN, Constr. Engr., Chicago Bridge & Iron Co., New York; and HARVEY L. MEYER, Div. Engr., Structural, Vitro Eng. Co., New York, N. Y.

10:00 Design Features of Fuel Handling and Waste Treatment at Indian Point Atomic Power Plant

W. B. WHITE, Boiler Div. Engr., Consolidated Edison Co., New York, N. Y.

Soil Mechanics and Foundations Division

9:00 a.m.

Presiding: Thomas M. Leps, Chairman, Exec. Committee

9:00 Stabilization of Excavations by Freezing

CHARLES P. GAIL, Winston Bros. Co., Morgan City, La.

9:15 Discussion

WILLIAM A. O'LEARY, Director, Div. of Sewage Disposal, N.Y.C. Dept. of Public Works, New York, N. Y.

9:30 Stabilization of New Haven Long Wharf Area for Industrial Development

JAMES D. PARSONS, Assoc. Partner, Moran, Proctor, Mueser & Rutledge, New York; and HENRY A. PFISTERER, Consulting Engr., New Haven, Conn.

9:50 Discussion

JOHN LOWE, III, Assoc. Partner, Tippetts-Abbett-McCarthy-Stratton, New York, N. Y.

10:00 Foundation Difficulties and Failures

JACOB FELD, Consulting Engr., New York, N. Y.

10:30 Discussion

EDWARD E. WHITE, President, Spencer, White & Prentis, New York, N. Y.

Structural Division

9:00 a.m.

Presiding: T. R. Higgins, Member, Exec. Committee

Structural Connections—Steel

9:00 Recent Trends in Structural Bolt Connections, Design and Specifications

EDWARD R. ESTES, JR., Chief Engr., Florida Steel Corp., Tampa, Fla.

9:30 Long Bolted Joints of Structural Steel

JOHN L. RUMPF, Assoc. Prof., Civil Eng., Drexel Inst. of Tech., Philalelphia, Pa.

10:00 Tensile Behavior of Large Riveted and Bolted Truss-Type Connections

E. CHESSON, JR., Asst. Prof., and WILLIAM H. MUNSE, Prof., Civil Eng. Dept., Univ. of Ill., Urbana.

10:30 Net-Section Design of Riveted and Bolted Tension Connections

WILLIAM H. MUNSE, Prof., and E. CHESSON, JR., Asst. Prof., Civil Eng. Dept., Univ. of Ill., Urbana.

Surveying and Mapping Division

9:00 a.m.

Construction Control Surveys

9:00 George Washington Bridge, Lower Deck and Approaches

HENRY DRUDING, Resident Engr., Port of New York Authority, New York, N. Y.

9:30 Professional Status

RALPH MOORE BERRY, Prof., Dept. of Civil Eng., Univ. of Michigan, Ann Arbor.

10:00 Instrumentation

C. R. MANOR, Asst. Chief, Survey and Geodesy Div., U. S. Army Geodesy, Intelligence and Mapping Research and Development Agency, Fort Belvoir, Va.

Department of Conditions of Practice

11:00 a.m. Ballroom

Sponsored by the Committee on Engineering Education

Presiding: CLARENCE H. AX, Chariman, Committee on Engineering Education

Panel discussion: **Graduate Programs in Civil Engineering—Their Organization and Influence on Undergraduate and Graduate Civil Engineering Curricula**

Moderator: KENNETH B. WOODS, Purdue University

Panel Members: N. A. CHRISTENSEN, Cornell Univ.

H. D. EBERHART, Univ. of California

R. E. STIEMKE, Georgia Inst. of Tech.

Discussion: **Results of the 1960 Conference on Civil Engineering Education**

WILLIAM P. KIMBALL, Dartmouth College

GENERAL MEMBERSHIP LUNCHEON

Thursday, Oct. 19

12:30 p.m. Georgian Room

Presiding: Newly-installed President, ASCE

Toastmaster: WILLIAM J. HEDLEY, Vice President, Zone III, ASCE

Speaker: REX M. WHITTON, Federal Highway Administrator, Washington, D. C.

Subject: Metropolis 1980—Urban Highways

All members and guests of the Society are cordially invited to attend this event. Tickets available until 10:00 a.m. Thursday.

Per plate, $5.50.

THURSDAY AFTERNOON

OCT. 19

City Planning and Highway Divisions

2:30 p.m.

2:30 Transportation Systems and Urban Growth Patterns

ALAN VOORHEES, Traffic Planning Engr., Automotive Safety Foundation, Washington, D. C.

3:00 Urban Transport Needs in the Future

WILBUR S. SMITH, Wilbur Smith & Assocs., New Haven, Conn.

3:30 The Journey-to-Work

ALEX HART, Exec. Director, New York–New Jersey Transportation Agency, New York, N. Y.

4:00 Central Business District Parking

LAURENCE A. DONDANVILLE, Staff Engr., Deleuw, Cather & Co., Chicago, Ill.

Engineering Mechanics Division

2:30 p.m.

Presiding: Ralph E. Fadum, Chairman, ASCE Committee on Research

Research in Civil Engineering

2:30 Relationship of Research in Civil Engineering to National Goals

EDWARD WENK, JR., Tech. Asst. To President's Science Advisor, and Exec. Sec'y, Federal Council for Science and Technology.

3:00 The Impact of Research on Engineering

GORDON BROWN, Dean of Eng., Massachusetts Inst. of Tech., Cambridge.

3:30 The Role of ASCE in Supporting Research

ELMER K. TIMBY, Partner, Howard, Needles, Tammen & Bergendoff, New York, N. Y.

4:00 Plans of the Research Committee, ASCE

NATHAN M. NEWMARK, Head, Dept. of Civil Eng., Univ. of Ill., Urbana.

FIELD TRIP TO INDIAN POINT ATOMIC POWER PLANT

Sponsored by Power Division

Thursday afternoon, Oct. 19

Buses leave hotel at 1:00 p.m.

This field trip will take registrants on an inspection tour of the Indian Point Atomic Power Plant of Consolidatel Edison. The plant, which is located on the site of the old Indian Point Amusement Park near Buchanan, N. Y., includes one 275,000-kw turbine generator; 163,000 kw of the rated capacity is furnished by the nuclear portion of the plant and 112,000 kw is furnished by fossil-fueled superheaters.

Buses return to hotel at 6:00 p.m. $1.75 per person.

Pipeline Division

2:30 p.m.

2:30 Future of Pipelining

CHARLES C. WHITTELSEY, President, Ford, Bacon & Davis, Inc., Constr. Corp., New York, N. Y.

3:00 Rate Structure

3:30 Underwriting

A. B. TREMIN, Dillon Read & Co.

Soil Mechanics and Foundations Division

2:30 p.m.

Presiding: Reginald A. Barron, Vice Chairman, Exec. Committee

2:30 Deflection and Stress Measurements on New Sheetpile Bulkhead at Port of Toledo, Ohio

PETER A. HAKMAN, Assoc. and Head, Structural Dept.; and WARREN M. BUSER, Structural Engr., Parsons, Brinckerhoff, Quade & Douglas, New York, N. Y.

3:00 Measurements on the New Pier at 39th Street, Gowanus Bay, Brooklyn, N. Y.

LEWIS H. RABBAGE, USNR Ret., Chief Engr.; EDWARD G. SMITH, Deputy Chief Engr.; and NICHOLAS F. MORRIS, Asst. Civil Engr., Dept. of Marine and Aviation, New York, N. Y.

3:30 Measurements on the New Brooklyn Pier 11 of the New York Port Authority

JOHN M. KYLE, Chief Engr.; MARTIN S. KAPP, Soils Engr.; DONALD YORK, Asst. Soils Engr.; and STEPHEN CIMBOLIC, Engr., Port of N. Y. Authority, New York, N. Y.

4:00 Discussion

STANLEY D. WILSON, Partner, Shannon & Wilson, Seattle, Wash.

4:15 Discussion

GREGORY P. TSCHEBOTARIOFF, Prof., Dept. of Civil Eng., Princeton Univ., Princeton, N. J.

Structural Division

2:30 p.m.

Presiding: Nathan D. Whitman, Jr., Vice Chairman, Exec. Committee

Structural Connections—Steel

2:30 Recent Trends in Welded Connections, Design and Specifications

LAMOTTE GROVER, Welding Engr., Air Reduction Co., New York, N. Y.

3:00 Experimental Investigations of Steel Pipe Connections

ANTHONY A. TOPRAC, Assoc. Prof., Dept. of Civil Eng., Univ. of Texas, Austin.

3:30 Evaluation of Fatigue in Welded Connections of Various Structural Steels

JAMES E. STALLMEYER, Prof. and Research Asst.; W. W. SANDERS, JR., Research Assoc.; and W. H. MUNSE, Prof., Dept. of Civil Eng., Univ. of Ill., Urbana.

4:00 Fatigue of Bolted Structural Connections

C. W. LEWITT, Research Asst.; E. CHESSON, JR., Asst. Prof.; and WILLIAM H. MUNSE, Prof., Dept. of Civil Eng., Univ. of Ill., Urbana.

UNITED ENGINEERING CENTER—OPEN HOUSE

Thursday, Oct. 19

5:15 p.m. to 9:15 p.m.

Assemble in auditorium on ground floor of United Engineering Center, 47th Street and 1st Avenue.

Musicians will be playing in the auditorium for your enjoyment, and starting from there small groups will be shown through the building. Your guide will show you through the ASCE quarters on the 17th and 18th floors and through the Engineering Societies Library. Your group will stop in the cafeteria for light refreshment before departing.

In order to avoid congestion at the new Center, colored tickets representing different hours for touring on Thursday evening will be available at the registration desk. Please specify your desired time when registering.

There is no charge for this event.

FRIDAY MORNING

OCT. 20

Hydraulics Division

9:00 a.m.

Presiding: Arno T. Lenz, Secretary, Exec. Committee; and Charles L. Bretschneider, Member, Committee on Tidal Hydraulics

Tidal Hydraulics

9:00 A Tidal Analysis of the Bay of Fundy

ARTHUR T. IPPEN and D. R. F. HARLEMAN, Profs., Hydrodynamics Lab., Mass. Inst. of Tech., Cambridge.

9:40 A Test of the Harmonic Method of Evaluation of Tides in a Branching Estuary System

ROBERT O. REID, Texas A.&M. College, College Station, Tex.

10:20 Corps of Engineers' Tidal Hydraulics Activities

JOSEPH M. CALDWELL, Chief, Research Div., Beach Erosion Board, U. S. Army, Washington, D. C.

Pipeline Division

9:00 a.m.

9:00 Thin-Wall Pipe

J. W. PIERCE, Supervisor of Eng. Standards, Southern California Gas Co., Los Angeles, Calif.

9:30 Pipeline Construction Equipment

JACK D. BURLEY, H. O. Penn Machinery, Inc.

10:00 Repairs to Existing Cast-Iron Distribution Systems

GEORGE C. MATTHEWS, Consolidated Edison Co. of New York, Inc., New York, N. Y.

Power Division

9:00 a.m.

Presiding: C. Russell Dole, Member, Exec. Committee

Pumped Storage Symposium

9:00 Pumped Storage: General Planning and Optimized Size of Facilities

EDWARD S. LOANE, Asst. Vice President; and R. D. LEY, Asst. Engr., General Public Utilities Corp., Reading, Pa.

9:30 Pumped Storage: Site Considerations and Field Investigations for Facilities

MILTON G. SALZMAN, Hydraulic Engr., Ebasco Services, Inc., New York, N. Y.

10:00 Pumped Storage: Smith Mountain Development

MARK J. HRONCICH, Structural Engr., American Electric Power Co.; and JAMES M. MULLARKEY, Senior Civil Engr., Ebasco Services, Inc., New York, N. Y.

10:30 Pumped Storage: in the United States

JAMES D. CALVERT, JR., Chief Planning Engr.; and C. A. HUNT, Vice President, Fargo Eng. Co., Jackson, Mich.

Soil Mechanics and Foundations Division

9:00 a.m.

Presiding: Jorj O. Osterberg, Member, Exec. Committee

9:00 Experiences with Canadian Varved Clays

VICTOR MILLIGAN, Principal, H. Q. Golder Assoc., Ltd.; and L. G. SODERMAN, Principal Foundation Engr., Dept. of Highways, Toronto, Ont., Canada.

9:25 Pore Pressures in a Foundation Clay

T. WILLIAM LAMBE, Prof. and Head of Soil Eng., Mass. Inst. of Tech., Cambridge.

9:50 Prediction of Swelling Potential for Compacted Clays

H. BOLTON SEED, Prof. of Soil Mechanics, Eng. Materials Lab., Univ. of Calif.; and R. J. WOODWARD, Senior Partner, and R. LUNDGREN, Partner, Woodward, Clyde, Sherard and Assocs., Oakland, Calif.

10:15 Strength Tests on Undisturbed and Remolded, Recompacted Samples from Two Twenty-Year-Old Earth Dams

RONALD C. HIRSCHFELD, Asst. Prof. of Soil Mechanics, Harvard Univ., Cambridge, Mass.

Structural Division

9:00 a.m.

Presiding: Emerson J. Ruble, Chairman, Exec. Committee

Structural Connections—Precast Concrete

9:00 Design Aspects of Precast Concrete Connections

WALTER B. BENNETT, JR., Asst. Manager, Structural and Railways Bur., Portland Cement Ass'n., Chicago, Ill.

9:30 Construction Aspects of Precast Concrete Connections

ARTHUR ANDERSON, Birkeland & Anderson, Tacoma, Wash.

10:00 Exposed Precast Concrete Connections

JAMES E. STANNERS, Chief Structural Engr., Shore & Moffat, Toronto, Ont., Canada.

10:30 Tests of Scarf Connections Between Precast Concrete Connections

J. R. GASTON and EIVIND HOGNESTAD, Manager, Structural Development Sect., Portland Cement Ass'n., Chicago, Ill.

Department of Conditions of Practice

11:00 a.m. Terrace Ballroom

Sponsored by the Committee on Professional Practice

Symposium and panel discussion: How the New Code of Ethics Affects You

Moderator: CHARLES M. WELLONS

Panel Members:
ROBERT K. LOCKWOOD
GEORGE E. BRANDOW
JOHN W. FRAZIER

FRIDAY AFTERNOON
OCT. 20

Engineering Mechanics Division

2:30 p.m.

Presiding: J. E. Cermak, Chairman; and G. T. Orlob, Member, Committee on Fluid Dynamics

Turbulent Diffusion

2:30 The Experimental Relation Between Turbulent Diffusion and Hot-Wire Anemometer Measurements

L. V. BALDWIN, Prof., Dept. of Civil Eng., Colorado State Univ., Ft. Collins; and W. R. MICKELSON, Research Engr., Lewis Research Center, National Aeronautics and Space Admin., Cleveland, Ohio.

3:00 The Mixing of a Turbulent Well Jet Into a Uniform Free Stream

M. S. ESKINASI, Prof., Dept. of Mech. Eng., Syracuse Univ., Syracuse, N. Y.

3:30 Scale Factors in Simulating Drifting Snow in a Wind Tunnel

F. ODAR, Civil Engr., U. S. Army SIPRE, Evanston, Ill.

4:00 Turbulent Diffusion in a Variable-Density Fluid

D. R. F. HARLEMAN, Prof., Hydrodynamics Lab., Mass. Inst. of Technology, Cambridge; and D. W. MCDOUGAL, Instructor, Iowa Inst. of Hyd. Research, State Univ. of Iowa, Iowa City.

Soil Mechanics and Foundations Division

2:30 p.m.

Presiding: H. Bolton Seed, Secretary, Exec. Committee

2:30 Review of Paris Conference Papers on Soil Properties

G. A. LEONARDS, Prof. of Soil Mechanics, Purdue Univ., Lafayette, Ind.

2:55 Shearing Resistance of Sands During Rapid Loadings

ROBERT V. WHITMAN, Assoc. Prof. of Soil Eng.; and KENT A. HEALY, Research Asst., Mass. Inst. of Technology, Cambridge.

3:20 The Effect of Material Properties on Consolidation and Secondary Compression

ROBERT L. SCHIFFMAN, Assoc. Prof. of Soil Mechanics, the Winslow Labs., Rensselaer Polytechnic Inst., Troy, N. Y.

3:45 New Concepts of Shearing Strength for Clay Soils

W. E. SCHMID, Assoc. Prof. of Civil Eng., Princeton Univ., Princeton, N. J.

Structural Division

2:30 p.m.

Presiding: Gerard F. Fox, Howard, Needles, Tammen and Bergendoff, New York, N.Y.

Structural Connections

2:30 Epoxy Resins as Structural Connections

GENE M. NORDBY, Head, Dept. of Civil Eng., Univ. of Arizona, Tucson.

3:00 Plastic Design of Steel and Concrete Composite Beams

GEORGE C. DRISCOLL, JR., Prof. and Research Asst., and ROGER G. SLUTTER, Fritz Eng. Lab., Lehigh Univ., Bethlehem, Pa.

3:30 Timber Connections

WILLIAM R. GANSER, Chief Structural Engr., American Inst. of Timber Construction, Washington, D. C.

Power Division

2:30 p.m.

Presiding: Robert Colburn, Vice Chairman, Exec. Committee

Pumped Storage Symposium

2:30 Pumped Storage: Development of Reversible Pump Turbines and Equipment

M. BRAIKEVITH, Tech. Manager, Water Turbine Design; and D. HARTLAND, Chief Hydraulic Research Engr., English Electric Co., Ltd., Lancashire, England.

3:00 Pumped Storage: Review of Existing Foreign Projects

RICHARD D. HARZA, Vice President, Harza Eng. Co., Chicago, Ill.

4:00 Pumped Storage: Reversible Pump Turbines—American Practice

F. E. JASKI, Sales Engr., Allis-Chalmers Mfg. Co., York, Pa.

ALUMNI REUNIONS

Cornell Society of Engineers

The Cornell Society of Engineers' Meeting will be held on Tuesday, Oct. 17 at the Engineers' Club, 32 West 40th Street. Cocktails will be served at 5:30 p.m., dinner at 6:30 p.m. Mr. Fred Wood, C.E., Consulting Engineer, will speak at 8:00 p.m. on "The Use of Space—Outer and Inner."

Manhattan College

The Manhattan College Dinner will be held on Thursday, Oct. 19, 6:00 p.m., at Ferdi's Restaurant, 765 United Nations Plaza, $5.00. Dinner will be followed by attendance at United Engineering Center Open House, at 8:00 p.m. Contact Robert Argueta, c/o Buck, Seifert and Jost, 112 East 19th Street, New York 3, N.Y.

Navy CEC Officers

Navy CEC Officers' Cocktails and Dinner will be held on Thursday, Oct. 19, 7:00 p.m., at the Officers Club, New York Naval Shipyard, Brooklyn. All officers of the CE Corps, former and present officers, regular and reserve officers, active and inactive officers, are invited to attend. Contact Capt. Robert Morris, CEC, USN, Public Works Officer, New York Naval Shipyard, Main 5-4500, Ext. 600.

Northeastern University

The Northeastern University Dinner will be held on Tuesday, October 17 at 6:30 p.m. at Shine's Restaurant, 426 Seventh Avenue, $7.00. Contact Kenneth W. Henderson, c/o Malcolm Pirnie Engrs., 25 West 43rd Street, New York 36, N. Y. or Prof. Ernest L. Spencer, Northeastern University, 360 Huntington Avenue, Boston 15, Mass.

Rutgers University Civil Engineering Alumni Dinner

Civil engineering alumni of Rutgers University will meet for dinner at the United Engineering Center on Thursday evening, October 19, during the ASCE Open House. Further details of this meeting will come by letter from the Civil Engineering Department at Rutgers.

Joint University of Illinois-Chi Epsilon Dinner

Two traditional events held in conjunction with the ASCE Annual Convention will be celebrated by an appropriate "joining of hands" on Thursday evening, October 19, at the newly occupied United Engineering Center. The 27th annual Eating Meeting of Chi Epsilon Fraternity and the 35th annual informal dinner of the University of Illinois Civil Engineering Alumni will be a combined affair of historic interest.

Beginning promptly at 5:00 p.m. in the Conference Room on the 18th floor of the Center, there will be a brief but impressive ceremony marking the dedication of the "Chi Epsilon Room." This is of special significance to the Illinois Alumni because the CE Department of the University was the "birthplace" of the Fraternity in 1922. Dinner (dress informal) will be served promptly at 6:00 p.m.

Your places will be reserved when your check (for $5.00, made out to Irvin Schwartz) is received. Maximum capacity is 121 places. For further information contact Mr. Irvin Schwartz, ASCE Headquarters, United Engineering Center, 345 East 47th Street, New York 17, N. Y. (Telephone Plaza 2-6800).

ANNUAL CONVENTION COMMITTEE

Gardner M. Reynolds, *Chairman*
Carl A. Arenander, Austin E. Brant, Jr., John F. Brennan, George A. Burpee, Robert H. Dodds, John H. Fisk, Arthur J. Fox, Jr., Thomas J. Fratar, Otis D. Gouty, Martin S. Kapp, Donald D. King, Robert K. Lockwood, Stephen M. Olko, Malcolm Pirnie, Jr., Robert W. Richards, John E. Robinson, Gordon Wallace, C. Richard Walter

Ladies' Entertainment Committee

Mrs. Gardner M. Reynolds, *Chairman*
Mrs. Carl A. Arenander, *Vice Chairman*
Mrs. Thomas J. Fratar, *Past Chairman*
Mrs. Waldo G. Bowman, Mrs. Austin E. Brant, Jr., Mrs. John F. Brennan, Mrs. George A. Burpee, Mrs. E. Lawrence Chandler, Mrs. Robert H. Dodds, Mrs. Arthur J. Fox, Jr., Mrs. Otis D. Gouty, Mrs. Martin S. Kapp, Mrs. Donald D. King, Mrs. E. Stuart Kirkpatrick, Mrs. Robert K. Lockwood, Mrs. Malcolm Pirnie, Jr., Mrs. Don P. Reynolds, Mrs. Robert W. Richards, Mrs. John E. Robinson, Mrs. Elmer K. Timby, Mrs. Gordon Wallace, Mrs. Richard Walter, Mrs. William H. Wisely

Ladies' Activities

A detailed program of ladies' activities will be available at the Registration Desk.

Sunday, Oct. 15

2:00 to 5:00 p.m. Registration

2:00 to 5:00 p.m. Tea in the Empire Suite

Monday, Oct. 16

9:00 to 10:00 a.m. Coffee, Hospitality Room (Empire Suite)

10:00 a.m. Dutch Treat Tour to Radio City Music Hall and lunch.

5:30 to 7:00 p.m. Icebreaker Party, Ballroom

Tuesday, Oct. 17

9:00 to 10:00 a.m. Coffee, Hospitality Room

9:30 a.m. to 4:00 p.m. Tour to "Sagamore Hill," Theodore Roosevelt's Summer White House at Oyster Bay, Long Island. Lunch at Milleridge Inn, Hicksville, Long Island

Wednesday, Oct. 18

9:00 to 10:00 a.m. Coffee, Hospitality Room

12:30 p.m. Awards Luncheon, Ballroom

6:30 p.m. Cocktails, Ballroom Rotunda

7:30 p.m. Dinner-dance and Reception, Ballroom

Thursday, Oct. 19

9:00 a.m. Continental Breakfast in the Hospitality Room

10:00 a.m. James W. Follin, Consulting Engineer of Washington, D.C., will present an illustrated talk on "The New Look in Cities."

12:00 noon. Fashion show and luncheon at the Plaza Hotel

5:15 to 9:15 p.m. Open House, United Engineering Center

Friday, Oct. 20

9:00 to 10:00 a.m. Coffee, Hospitality Room

SESSIONS OF THE BOARD

The ASCE Board of Direction will be in session in the Washington Room beginning at the following times:
Monday, Oct. 16, 9:00 a.m.
Tuesday, Oct. 17, 9:00 a.m.
Thursday, Oct. 19, 2:30 p.m.

THEATER AND TV TICKETS

Assistance with the purchase of theater tickets and in securing tickets for television shows will be available in the Ladies' Hospitality Room.

ASCE NEWS

ASCE Protests Unlimited Saline Water Program

On behalf of ASCE, Executive Secretary William H. Wisely has written interested legislators urging that Congress defer enactment of Titles II and III of H.R. 7916 until adequate hearings can be held on the provisions authorizing the federal government to construct and operate an indeterminate number of saline water-conversion plants, thus putting the government into the municipal water supply business.

The Society action was initiated by the Liaison Committee on EJC National Water Policy, which is headed by Carey H. Brown. The other members are Past President Louis R. Howson, Thorndike Saville, Mercel J. Shelton, and I. C. Steele.

Mr. Wisely noted that various provisions of the titles appear to be in conflict with the "Statement of Principles of a Sound National Water Policy," developed by Engineers Joint Council. "Portions of these titles," he said, "provide for an indeterminate number of 'up to fifty million gallons per day' conversion plants and for substantial federal loans and grants to municipalities and others for the construction and operation of saline water-conversion plants."

The EJC criteria for a sound national water supply hold that all water developments should be carried out at the lowest practicable government level and should be demonstrably justified economically. "It is the Society's view," wrote Mr. Wisely, "that no present or foreseeable national emergency exists with respect to adequate sources of municipal water supply, which would require such substantial federal intervention as is contemplated in Titles II and III of the proposed legislation. Certain minor local situations do exist where saline water-conversion plants are now or may, in the future, be economical. However, such situations are so special and so rare that no large and uncontrolled invasion of the rights, powers, and obligations of local government is required."

Policy Statement on the Civil Engineer in Planning

Urban planning is one of the spheres of practice in which civil engineers have engaged throughout the recognized existence of the profession. The Society's City Planning Division was established 38 years ago, almost at the outset of the Technical Division organization of ASCE. The current interest of members of the Society in the planning field is demonstrated by the enrollment of some 3,000 in the City Planning Division.

Despite these facts, as a result of the recent rapid expansion of urban planning activity and the entry of persons from many other disciplines into the field, the role of the civil engineer in urban planning has sometimes been obscured. To assist in clarification of his role, the Board of Direction has authorized the formation and publication of this policy statement, prepared by a subcommittee and approved by the Committee on Division Activities and the Executive Committee of the Board.

In response to numerous inquiries, this statement has been prepared to affirm the relationship of urban planning to the practice of civil engineering.

Civil engineering is the profession in which a knowledge of the mathematical and physical sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the progressive well-being of mankind in creating, improving, and protecting environment, in providing facilities for community living, industry and transportation, and in providing structures for the use of mankind.

The term **planning** is used to denote the process of assembly of information, analysis of data, and formulation of documentary guides and plans by specialists, including civil engineers, for the establishment, arrangement, improvement, and redevelopment of physical facilities and land areas for the purpose of preserving and enhancing the health, safety, convenience, welfare, and character of communities and developing to the fullest their economic, social, and cultural potential. When applied to urban areas, this process is designated as **urban planning** or **city planning.** The terms **metropolitan planning, regional planning,** and **county planning** also are employed in accordance with the extent of area covered.

Most planning assignments require a diversity of talents and professional skills effectively coordinated by a **director of planning,** who may be an engineer, architect, landscape architect, planner, or economist with suitable professional training and experience.

Land use planning requires adequate consideration of the physical facilities needed for the anticipated uses. In the use of urban land, usually the controlling economic factor lies in the extent and quality of the services with which the land is or can be provided. The roots of urban growth lie in the service systems that make an intensified use of land possible. These service systems are provided by civil engineering practice, which is one of the logical disciplines upon which to base a practice of urban planning.

A person who occupies a responsible position in planning must have knowledge of the principles of spatial arrangements, criteria for allocating land uses and delineating physical facilities, and techniques for their effective coordination. A knowledge of the basic physical sciences, mathematics, and economics, supplemented by familiarity with the social and behavioristic sciences, is essential.

Civil engineers are qualified particularly to initiate and conduct research to establish the true effect of trends in urban development patterns on the economics and service value of existing and proposed systems of physical facilities.

Inasmuch as city engineers or public works directors usually supervise

the execution of officially adopted comprehensive plans, they should participate actively in the planning process. Their special knowledge will be helpful in assuring economic and feasible programs of physical facilities. Their participation should begin with the initiation of the studies at which time the engineering skills required are of the highest order.

A master plan requires the application of engineering concepts, judgment, and analysis to be a competent guide for the safe and economical expenditure of the resources of a community. Civil engineers who have suitable training and experience are competent to do planning work, ranging from that of **staff assistant** to that of **director** or **manager.**

ASCE Honorary Member Charles Buford Dies

Charles H. Buford, Honorary Member of ASCE and an authority in the field of railroad operation and railroad engineering economics, died recently in St. Petersburg, Fla. He was 75. Mr. Buford spent most of his working years with the Chicago, Milwaukee, St. Paul & Pacific Railroad Company, rising through the ranks to the presidency. He first became connected with the railroad in 1907, following his graduation as a civil engineer from the University of Arkansas. He had been general manager of the Milwaukee Road's Lines East and Lines West, and from 1947 until his retirement a few years ago he was president of the company and had a seat on its board of directors.

Mr. Buford left the Milwaukee Road in 1939 to become vice president of the Association of American Railroads in charge of operations and maintenance, with headquarters in Washington. In this position during the war years he was the central figure in the railroad industry, to whom military planners looked for guidance in their overwhelming problem of transporting troops and supplies. For his services in expediting wartime transportation, he received the President's Certificate of Merit, the Certificate of Appreciation of the Navy Bureau of Naval Personnel, and a Certificate of Appreciation from the War Department. At the end of the war, Mr. Buford returned to the Milwaukee Road.

Mr. Buford became a member of ASCE in 1917 and was made Honorary Member in 1948.

ASCE Executive Committee Meets in Kansas City

The ASCE Executive Committee held a regularly scheduled meeting in Kansas City early in August. Shown in session are (left to right) Vice Presidents William J. Hedley and Charles B. Molineaux; Past President Frank A. Marston; President Glenn W. Holcomb; Executive Secretary William H. Wisely; Past President Francis S. Friel; and Vice Presidents Donald H. Mattern and Lawrence A. Elsener.

The ASCE Executive Committee met in Kansas City on August 4 to take action on matters requiring executive attention between meetings of the Board of Direction. In attendance were President Holcomb, Past Presidents Marston and Friel, Vice Presidents Elsener Molineaux, Hedley, and Mattern, and Executive Secretary Wisely.

One action taken was in connection with ASCE policy on planning functions in civil engineering. The Committee on Division Activities had previously been directed by the Board to prepare recommendations concerning the role of civil engineering in the planning of physical facilities and systems, and to suggest proper procedures for utilizing the services of civil engineers in this capacity. The CDA's recommendation, which proposed bringing the American Institute of Architects into the study of professional planning functions, had been approved by the Executive Committee by mail ballot.

At the Kansas City meeting the Committee endorsed a proposal that the AIA be brought into the study, either through participation in the ASCE-AIP (American Institute of Planning) Joint Committee or by cooperative action between the ASCE-AIP and the AIA-AIP Joint Committees. The CDA based its proposal on findings of the ASCE-AIP Joint Committee that participation of the AIA in its activities would be desirable.

At the request of the Ethics Committee of the Engineers Council for Professional Development, the Executive Committee reaffirmed earlier (1950) approval by the Board of Direction of the ECPD Canons of Ethics. Its endorsement was based on a report of the Committee on Professional Practice, which recently reviewed the Canons and found them "satisfactory and compatible with the amended ASCE Code of Ethics."

The Committee also approved in principle Executive Secretary Wisely's proposal for a revision of ASCE technical programs. Mr. Wisely's proposal, entitled "New Concept for Technical Programs of ASCE," appears on page 44 of this issue.

SOCIETY AWARDS AND FELLOWSHIPS AVAILABLE

DANIEL W. MEAD PRIZES:	*New contest closes June 1, 1962. See Official Register, page 152.*
FREEMAN FELLOWSHIP:	*New contest opens. See Official Register, page 158.*
J. WALDO SMITH HYDRAULIC FELLOWSHIP:	*1961-1962 contest closed. No 1962-1963 contest offered.*
RESEARCH FELLOWSHIP:	*1962 contest open; $5,000 grant. Deadline date January 1, 1962. See Official Register, page 160.*

Advances in Hydraulics Described at Urbana Conference

Both research developments and improvements in the techniques of professional practice were made a part of the record in papers presented during the recent Tenth Annual Hydraulics Conference. The conference, held on the campus of the University of Illinois, Urbana, July 16-18, featured sessions prepared by seven of the committees of the Hydraulics Division. In addition, many in attendance took part in scheduled committee meetings, and all benefited by the stimulus of a return to campus life. It is expected that the papers presented during the planned sessions will be published in successive issues of the Hydraulics Division Journal.

Sessions were presented by the Committees on Ground Water Hydrology, Hydraulic Structures, Surface Water Hydrology, Sedimentation, Hydrometeorology, and Flood Control.

In addition, two major policy addresses were given during the conference. The first, presented by Executive Secretary William H. Wisely, described the improvements in the member service that would be made possible through changes in the character of the Society's Convention planning and scheduling, and the extension of research activities. Mr. Wisely has been describing the operation and advantages of the proposed change in ASCE technical programs to a series of national technical conferences. His proposal is detailed on page 44 of this issue.

A challenge to the hydraulic engineer was presented by Commissioner Floyd E. Dominy, of the U. S. Bureau of Reclamation. Mr. Dominy listed five demands to be made of engineers concerned primarily with hydraulics during the next four decades:

1. Regulating streamflow through the construction of multiple-purpose water-resource projects.
2. Improving the quality of our streams through more adequate pollution-abatement programs.
3. Making better use of underground storage.
4. Increasing the efficiency with which water is used through elimination of wasteful practices, improved sewage treatment methods, and increased irrigation efficiency.
5. Increasing water supplies by demineralization of saline and brackish waters and by other artificial means.

Mr. Dominy reminded the group that "without the work of hydrologists and hydraulic engineers, much of the world would remain forever undeveloped and uninhabitable." He then quoted some astonishing figures to support his thesis that there is no actual water shortage:

"Experts say the average precipitation over the surface of the world every year is about one quintillion, 320 quadrillion gallons—give or take a few billion. Assuming a current world population of about three billion, this means that the world water supply from precipitation is over one million gallons per day for each man, woman, and child now alive. We can all drown very comfortably in that amount of water.

"Statements that we are about to exhaust our meager water supplies are seemingly a lot of nonsense if we speak from a global point of view. But what happens to all this water? A large part is transpired through vegetation. More is lost by evaporation from open bodies of water. But the great bulk of it reaches the salt waters of the ocean to start a complete recycle without any use by man.

"Our problem then, is distribution, which is a problem of both time and area. These factors, time and location, point to one essential need, and that is storage. Whether it be on the surface or below the ground, or by some means yet unknown, we have the primary problem of storage.

"I have high hopes that many of us will live to see the day when the storage of runoff is accepted as a necessary fact of life and all our major streams and rivers are controlled through structures for the benefit of all men everywhere."

Local Planning Committee for the Hydraulics Conference (left-hand photo) checks last-minute details. Seated, left to right, are Professors Ven Te Chow and Wallace M. Lansford, co-chairmen; William C. Ackermann, co-chairman; and Harold W. Humphreys, Publicity. Standing are John B. Stall, Entertainment; Prof. Murray B. McPherson, Technical Program; and Prof. James M. Robertson, Registration. Other Planning Committee members not available for photo were Professors Maryln E. Clark and John C. Guillou, William D. Mitchell, and Wyndham J. Roberts. Members of the Hydraulics Division Executive Committee (right-hand photo) present for the conference are (seated, in usual order) ASCE Director Samuel S. Baxter, Chairman Maurice L. Dickinson, and Vice Chairman Eugene P. Fortson. Standing are Herbert S. Riesbol and Arno T. Lenz, secretary. More than 200 engineers attended the conference.

Both the University of Illinois and the Central Illinois Section of ASCE cooperated with the Hydraulics Division in the presentation of the Urbana Conference. The university, under the chairmanship of W. M. Lansford, W. C. Ackerman, and V. T. Chow, provided facilities for housing the conference sessions and made plans for the cordial entertaining of engineers and their families.

The program was arranged and coordinated through the efforts of the Hydraulics Division Executive Committee, of which Maurice L. Dickinson is chairman.

Changes in New ASCE Transactions

In mid-May all Society members received a brochure describing the revamping that ASCE TRANSACTIONS is undergoing. Since then thousands of orders for Volume 126 (1961) have been received. For the benefit of others who have not yet ordered, a coupon to facilitate ordering has been provided on page 152. Persons who have already placed an order should not return the coupon.

Beginning with Volume 126, TRANSACTIONS will be issued as a standard set in five parts, containing all Division Journal papers, according to the following schedule:

Part I.	Engineering Mechanics, Hydraulics, Soil Mechanics and Foundations
Part II.	Construction, Structural
Part III.	Irrigation and Drainage, Power, Sanitary Engineering
Part IV.	Air Transport, City Planning, Highway, Pipeline, Surveying and Mapping, Waterways and Harbors
Part V.	Professional Practice

Members of ASCE may enter standing orders for single copies of any one, or more, of Parts I through IV at $3.50 each per year; the price for Part V will be $2.00 per year. They can effect a considerable saving by subscribing to all five parts, which will reduce the total price of $16.00 to $10.00.

Part V will be reserved for papers published in the *Journal of Professional Practice*, of interest to all members, regardless of their technical specialties. Part V will also contain the President's Annual Address, abstracts of the memoirs of deceased members, final reports of committees in the Department of Conditions of Practice, and combined subject and author indexes for Parts I through V.

The TRANSACTIONS is mailed in December of each year, and the bills are sent out at that time. Members who overlooked the earlier mailing should place their orders now to insure delivery. Remember the coupon on page 152.

Freeman Fellowship Goes to Civil Engineer

Jacques William Delleur, of the School of Engineering, Purdue University, has been appointed ASCE Freeman Fellow for the academic year, 1961-1962. A sum, not to exceed $3,000, has been allocated for the fellowship.

Dr. Delleur, who is an associate professor of hydraulic engineering at Purdue, will use the fellowship doing post-doctoral study and research in the Fluid Mechanics Laboratory of the University of Grenoble, France. He will take sabbatical leave from Purdue to conduct the work in France. He holds a doctor's degree from Columbia University, where he taught before joining the Purdue engineering faculty in 1955.

The objectives of Dr. Delleur's research will be to investigate the motion of secondary flow in non-circular conduits, to investigate the coupling of secondary currents and turbulent stresses, to investigate the effects of secondary currents on boundary layer behavior, and to investigate the ways of artificially inducing or inhibiting secondary motion.

The Freeman Fund was established in 1924 by the late John R. Freeman, Past President and Hon. M. ASCE, to be used in the aid and enoucragement of young engineers, especially in research work. Similar fellowships are also given by the ASME and the Boston Society of Civil Engineers. Since 1949 ASCE and ASME have staggered their awards, each giving the fellowship every other year in alternating years.

Jacques Delleur

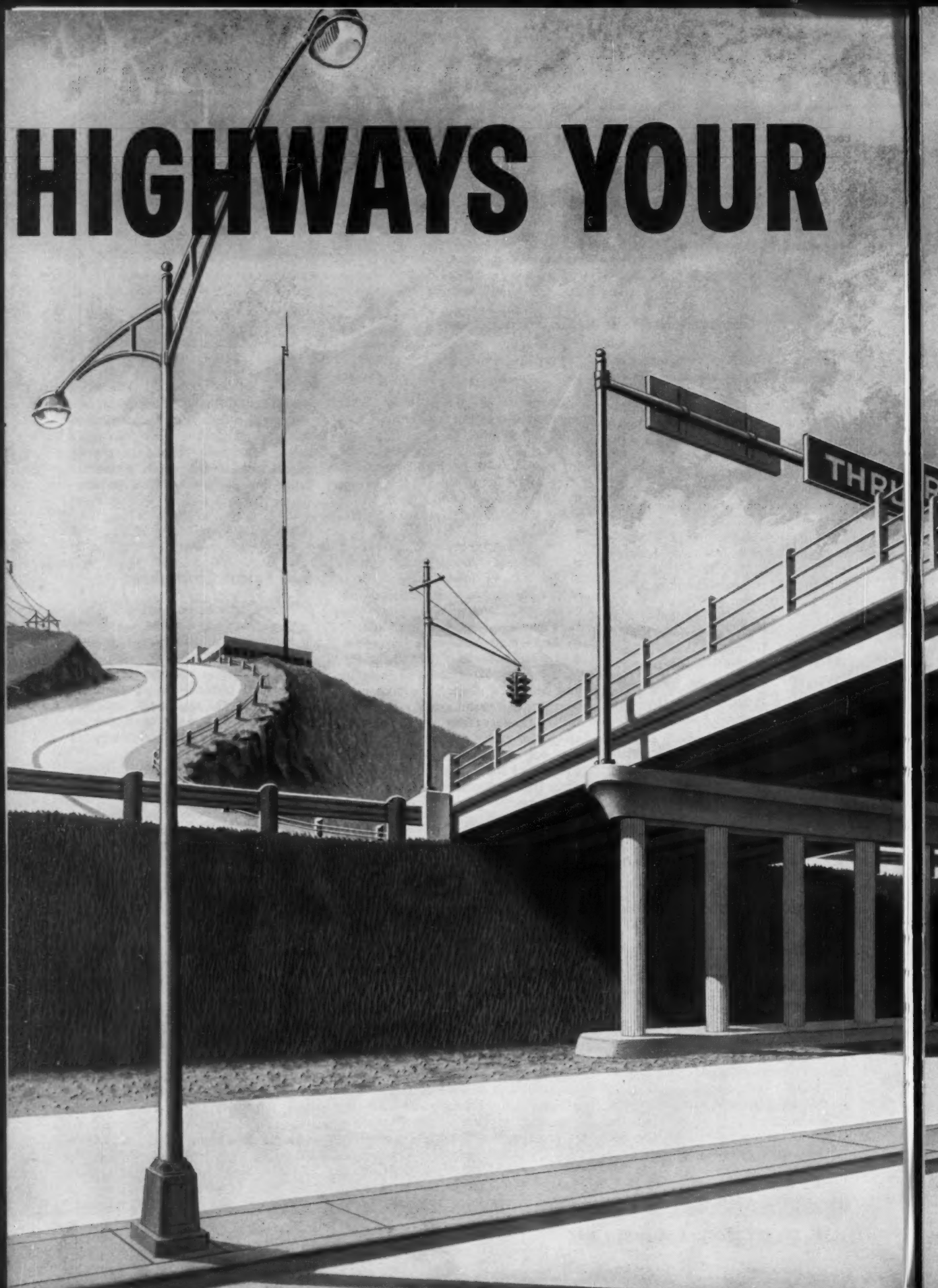
EJC Forms Committee on Computation Systems

Engineers Joint Council has recently formed a Committee on Computation and Informaton Processing Systems. This group will provide coordination and channels of communication between the engineering societies, as well as a central source of data on information-processing technology in engineering.

In order to activate its aims, task committees are being organized in the following eight categories:

1. Joint Meetings
2. Liaison within Societies and with Other Societies
3. Professional Training
4. Program Documentation and Interchange
5. Languages
6. Information Storage and Retrieval
7. Standardization
8. Overall Systems Cost

Volunteers with experience and interest in each of these areas are needed from each of the Founder Societies to properly reflect all interests. All members of ASCE who can contribute to this cooperative effort on computers and information processing are requested to notify the ASCE representative on the Committee: F. R. Klauck (Engineering Department, E. I. du Pont de Nemours & Co., Wilmington 98, Del.), indicating the categories in which they are especially interested.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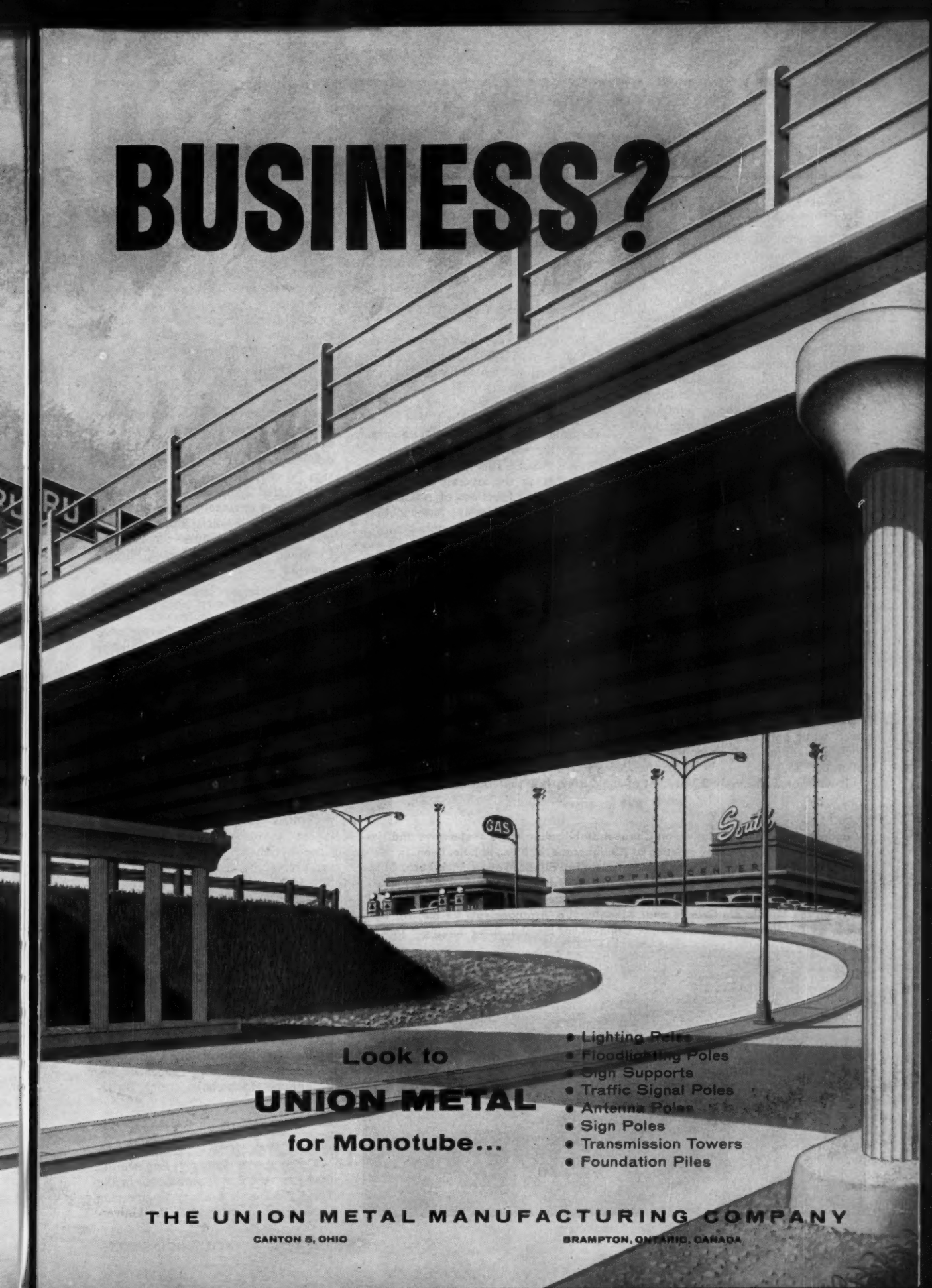
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• Lighting Poles
• Floodlighting Poles
• Sign Supports
• Traffic Signal Poles
• Antenna Poles
• Sign Poles
• Transmission Towers
• Foundation Piles
THE UNION METAL MANUFACTURING COMPANY
CANTON 5, OHIO
BRAMPTON, ONTARIO, CANADA

Division Doings

City Planning Division

A recent meeting of the City Planning Division's Committee on City Planning Functions in Municipal Administration was devoted to review of the results of a questionnaire survey conducted last year by the committee. The questionnaire went to all directors of public works or municipal engineers in communities of over 5,000 in the United States. The aim was to study the relationship between the various professions and the preparation of adequate plans for community development.

Of some 2,600 questionnaires sent out, there was a return of 944, or about 37 percent. Coverage by size of place was satisfactory except in the 5,000-to-10,000 range. Many of the governing units in this category have neither an engineer nor a planning commission. However, the committee notes that 91 percent of the local units reporting do have a planning agency. In 797 places, or 84 percent of the returns, the municipal engineer or director of public works participates in the planning. He is very likely to be the technical adviser to the planning agency. The findings also showed that there is most likely to be a separate planning staff in cities of 25,000 and over, while only in rare cases is there such a planning staff in communities of under 25,000.

It was noted that only 22 percent of the engineers belong to ASCE, and that three other associations all have a higher representation of municipal engineers. They are the American Public Works Association, the National Society of Professional Engineers, and the American Water Works Association.

In answer to the question, "Have the activities of ASCE produced information or material which have been helpful in solving city planning problems for your municipality?", 169 replies, or 18 percent, said that ASCE had helped them. However, most of those answering in the affirmative were not members of ASCE. This is thought to indicate that in the overall picture, the city planning functions of ASCE have been of little help to the municipal engineer or director of public works throughout the United States. It was recommended that a panel discussion on the subject, "The Role of the Municipal Engineer and City Planner," be held at the New York Convention in October. The preparation of a basic civil engineering text for city planners and of a city planning text for civil engineers was also recommended.

Pipeline Division

The Division's Committee on Pipeline Planning reports that at present the bulk of its membership is made up of civil engineers in the gas and oil industry, but that the control group is eager to enlarge the committee "to include hydraulic, water works, and sanitary engineers who have an interest in the design of pipeline facilities." Major activities of the Committee include the investigation of problems involved in the regulation of pipeline design and construction, welding of pressure vessels, investigation of economic aspects of pipeline corrosion, and compilation of a bibliography of pipeline design.

In addition to asking for the active participation of hydraulic, water works, and sanitary engineers, the Committee will also welcome suggestions for other areas of study and investigation that could be helpful to the pipeline industry. Only with the cooperation of these groups of engineers, the committee believes, can the many differences in concept of pipeline design be correlated.

Interested hydraulic, water works, and sanitary engineers are urged to get in touch with Francis Stastny, Chairman of the Committee on Pipeline Planning, 3923 Milton Street, Shreveport, La.

Members of the Task Committee on Channel Stabilization of the Waterways and Harbors Division had a two-day meeting at Albuquerque, N. Mex., in June. Seen, in usual order, are Daryl Simons, Fort Collins, Colo.; Harvill E. Weller, Vicksburg, Miss.; Francis Escoffier, Mobile, Ala.; Oliver Johnson, Portland, Ore.; and Albert Bettle, El Paso, Tex. A day was given to an inspection tour of the bank stabilization structures on the Middle Rio Grande near Albuquerque. Arrangements for the trip were made by Col. John F. Arfman, district engineer for the U.S. Army Engineer District.

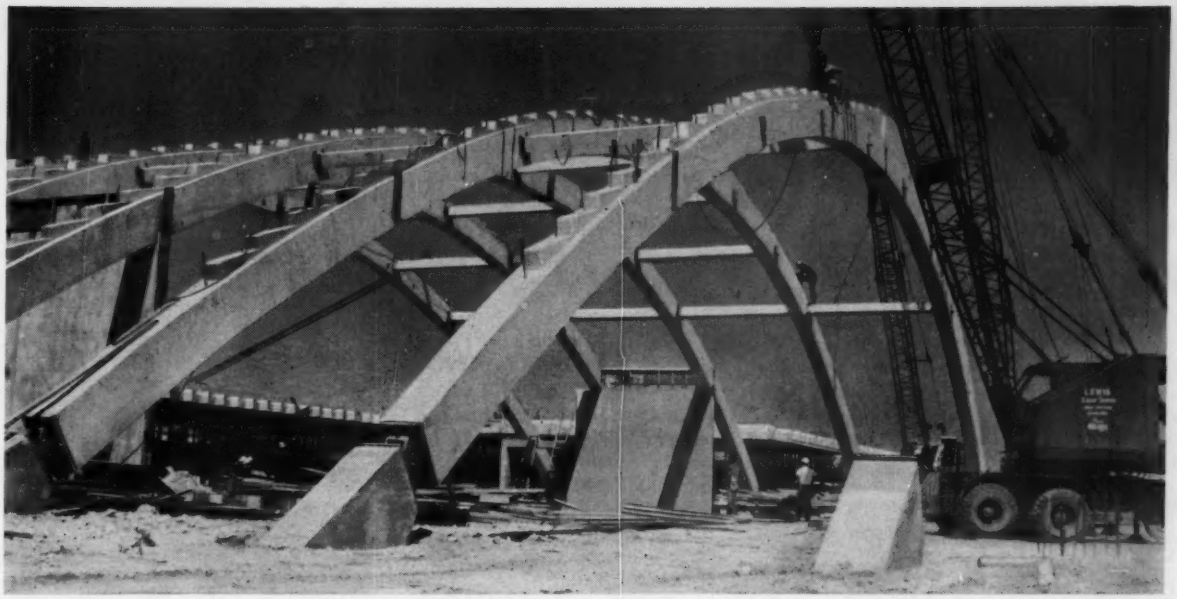
Structural Design

With private industry's taking over the industrial development of nuclear energy, architect-engineers and consultants must familiarize themselves with federal rules and regulations governing the design and construction of nuclear facilities. For this reason, members engaged in nuclear work will be interested in a new report, summarizing the basic requirements governing design, construction, and operation of nuclear facilities. The report —entitled "U.S. Atomic Energy Reglations Governing the Design and Construction of Nuclear Facilities"— was prepared under the auspices of the Structural Division's Committee on Nuclear Facilities. The author is Gibson Morris, M. ASCE, chairman of the Committee's Task Committee on Nuclear Insurance. Copies of the valuable report may be obtained from Mr. Morris, who is at the Oak Ridge National Laboratory, Oak Ridge, Tenn.

For the benefit of members who report difficulty in getting in touch with the International Association for Bridge and Structural Engineering, the address is: Room 42C, Eidgenössiche, Technische Hochschule, Zurich, Switzerland.

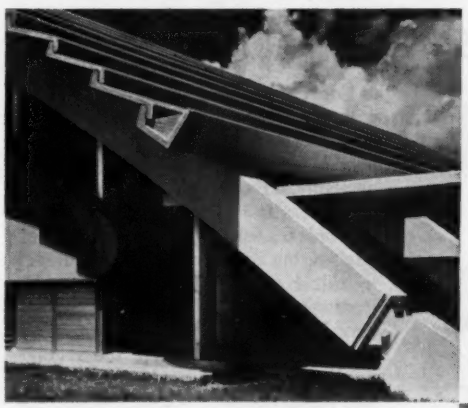
Sanitary Engineering Division

Through the Sanitary Engineering Division, ASCE will participate in the Third Pittsburgh Sanitary Engineering Conference, to be held at the Univer-



Each of the arches spans 160′ and is spaced 16′ center to center. The arch skeleton is braced by precast lateral members with welded connections. Gym floor space is 12,000 sq. ft., and there is a 10′ wide covered walkway on each side. Note "steps" and projecting dowels cast into arches for securing roof panels.

Closeup shows shape and ceramic tile finish of roof slabs. Each panel spans 16′, is 2″ thick, and 4′ wide including upward and downward legs. Special units at bottom act as rain gutter. Aqua colored high-glaze tile was applied by casting it integrally with the slabs as a form liner. Tiles were later grouted and given a coat of silicone waterproofing.



UNUSUAL PRECAST CONCRETE DESIGN FOR GYM ROOF

Modern precast concrete was imaginatively used to achieve an outstanding combination of function and beauty in Miami Central High's new gymnasium.

The three-hinged arches were cast on a concrete form at Precast Corporation's plant for minimum tolerances and maximum uniformity. In place, they rise directly from buttress footings supported on precast piling. Unusual precast roof slabs span the 16′ between arches. In addition to upward and downward legs for a shingle-type fit, the slabs also have a unique facing of glazed tile.

Lehigh Early Strength Cement was used for peak efficiency in the production of all precast units. In precasting the arches, for example, its use made it possible to turn out two arch-halves a week from a single form. Lehigh Portland Cement Company, Allentown, Pa.

Miami Central High School Gymnasium

Architects: Polevitzky, Johnson & Associates
Structural Engineers: H. J. Ross Associates
Contractor: Thompson-Polizzi Construction Co.
Fabrication/Erection of Precast Concrete: Precast Corp.

All of Miami, Florida

LEHIGH CEMENTS

View of completed gym speaks for its grace and practicality. Roof slabs were attached only by welds to dowels in the arches, solving problems involving thermal expansion and contraction. Then joints were covered with sheet copper strips set in a caulking compound.

sity of Pittsburgh's Graduate School of Public Health, Pittsburgh, November 4. Latest methods for solving problems associated with the disposal of municipal solid waste will be highlighted on the program. Sponsors, in addition to ASCE, will be the Graduate School of Public Health; the Civil Engineering Department of Carnegie Institute of Technology; the Associated Wastes Engineers of Pittsburgh; and the Pennsylvania Department of Health.

Persons wishing to pre-register may send $5.00 (to cover both registration and luncheon) to: Chairman Eugene Weisberg, 1626 Forbes Avenue, Pittsburgh 19, Pa.

Waterways and Harbors Division

The Waterways and Harbors Division is taking part, as co-sponsor, in the fiftieth annual meeting and convention of the American Association of Port Authorities. The joint program will be held at the Lafayette Hotel, Long Beach, Calif., September 25-29.

Division participation in the technical program will include a panel discussion on "Port Design and Construction," moderated by Ben E. Nutter, assistant executive director and chief engineer of the Port of Oakland. Panel participants will be Richard C. Krahn, harbor engineer for the Milwaukee (Wis.) Board of Harbor Commissioners; Richard Bartle, of the San Francisco firm of Stone and Youngberg; and Ralph Tudor, partner in the Tudor Engineering Company, San Francisco, Calif.

ASCE ENGINEERING SALARY INDEX

Prepared Semiannually

Consulting Firms

City	Current	Previous
Atlanta	1.38	1.38
Baltimore	1.16	1.14
Boston	1.26	1.23
Chicago	1.44	1.50
Denver	1.32	1.25
Houston	1.31	1.26
Kansas City, Mo.	1.26	1.19
Los Angeles	1.36	1.35
Miami	1.38	1.38
New Orleans	1.25	1.22
New York	1.30	1.29
Pittsburgh	1.11	1.07
Portland, Oregon	1.31	1.28
San Francisco	1.38	1.35
Seattle	1.13	1.13

Highway Departments

Region	Current	Previous
I, New England	1.03	1.03
II, Mid Atlantic	1.18	1.15
III, Mid West	1.32	1.26
IV, South	1.12	1.12
V, West	1.16	1.13
VI, Far West	1.20	1.16

Sole purpose of this Index is to show salary trends. It is not a recommended salary scale. Nor is it intended as a precise measure of salary changes. The Index is computed by dividing the current total of base entrance salaries for ASCE Grades I, II and III by an arbitrary base. The base used is $15,930, the total of salaries paid in 1956 for Federal Grades GS5, GS7 and GS9. Index figures are adjusted semiannually and published monthly in CIVIL ENGINEERING. Latest survey was June 30, 1961.

ASCE CONVENTIONS

ANNUAL CONVENTION

New York, N. Y.
Hotel Statler
October 16-20, 1961

HOUSTON CONVENTION

Houston, Tex.
Hotel Shamrock Hilton
February 19-23, 1962

OMAHA CONVENTION

Omaha, Nebr.
Hotel Sheraton-Frontenelle
May 14-18, 1962

TECHNICAL DIVISION MEETINGS

AMERICAN ASSOCIATION OF PORT AUTHORITIES CONVENTION

Long Beach, Calif.
September 25-29, 1961
Co-sponsored by
Waterways & Harbors Division

SYMPOSIUM ON CONSERVATION OF AIR RESOURCES

New York, N. Y.
New York University
November 17, 1961
Sponsored by
Sanitary Engineering Division
Research Council on Air Resources Engineering

ENGINEERING MECHANICS DIVISION CONFERENCE

Austin, Tex.
University of Texas
April 26 and 27, 1962
Sponsored by
Engineering Mechanics Division

DISTRICT CONFERENCES

DISTRICT 4 COUNCIL

Harrisburg, Pa.
October 7, 1961

PACIFIC SOUTHWEST COUNCIL

San Diego, Calif.
El Cortez Hotel
April 5-7, 1962

PACIFIC NORTHWEST COUNCIL

Seattle, Wash.
Olympic Hotel
April 20 and 21, 1962

NOTES FROM THE LOCAL SECTIONS

Central Pennsylvania—Regular monthly meeting at the Harrisburg Country Club, September 14, at 6:00 p.m.

Intermountain—Regular monthly meetings the fourth Friday of each month.

Massachusetts—Summer luncheon meeting at the Hotel Lenox, Boston, September 21, at 12:15 p.m.

Sacramento—Weekly luncheon meetings at the Elks Temple every Tuesday, at 12 noon.

St. Louis—Regular monthly luncheon meetings at the York Hotel on the fourth Monday of each month, at 12:15 p.m.

Tennessee Valley—Fall meeting at the University of Tennessee, Knoxville, November 3 and 4.

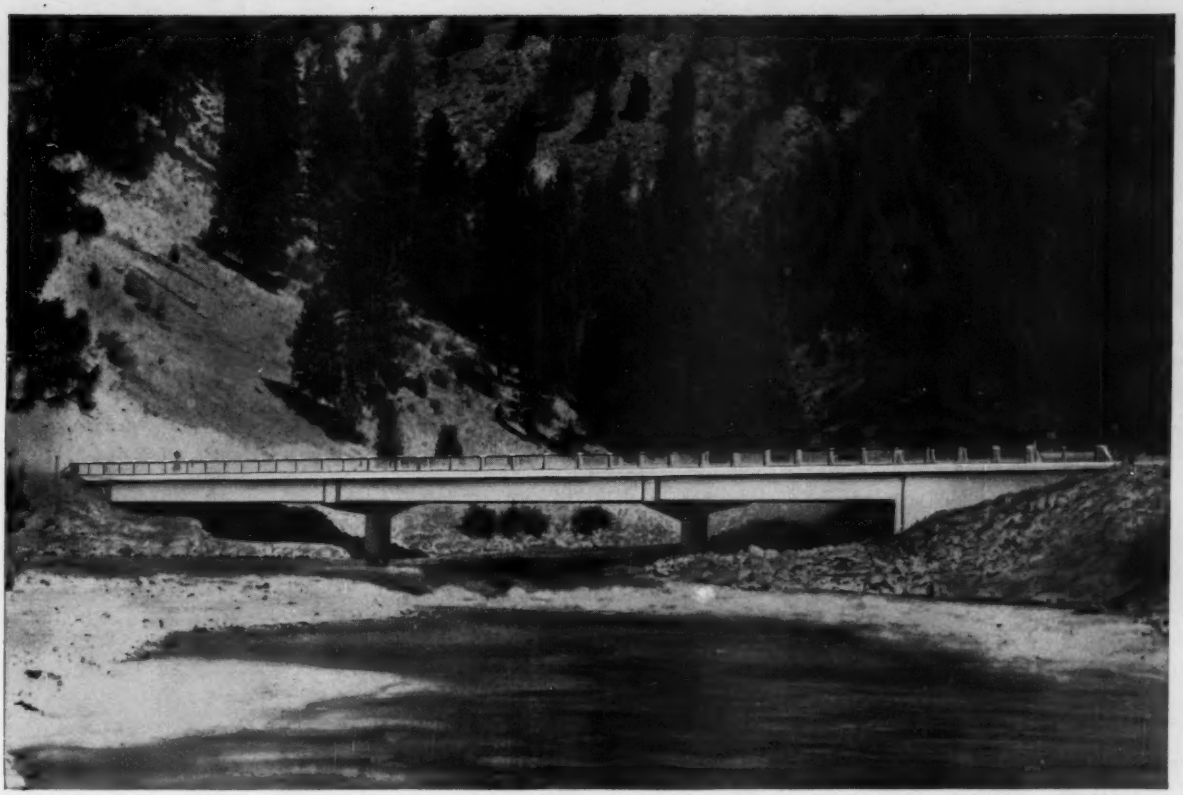
Texas—Fall meeting in Austin, October 5-7.

Engineering Index Issues 1960 Guide

For engineers who must keep up with the ever-growing technical press, it will be good news that the 1960 Volume of the Engineering Index is now available. Engineering Index, Inc., which was founded in 1884, annotates and indexes selectively, on the basis of engineering significance, all the current technical periodicals received by the Engineering Societies Library. In all, over 3,300 publications in 22 languages are covered. Included are the regular professional journals, trade journals, and publications of the engineering societies, scientific and technical associations, universities, laboratories and research institutions, government departments and agencies, and industrial organizations.

The service is divided into 249 fields of interest. It is issued in two forms—on library cards mailed weekly to subscribers, and in a bound reference that contains the information distributed by the card index service for the full calendar year.

Copies of the 1,759-page reference may be obtained from the Engineering Index, Inc., 345 East 47th Street, New York 17, N.Y. The price is $75 postpaid.



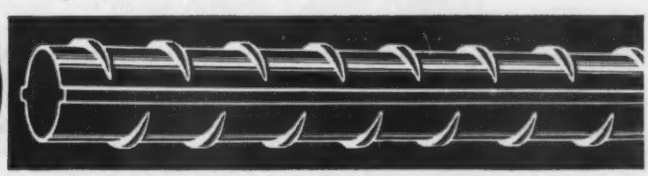
274' Continuous Girder Bridge over South Fork of Payette River, Boise County, Idaho
Designers: Bureau of Public Roads
Contractor: Hansen & Parr Construction Co., Spokane, Wash.

Increase the effectiveness of your highway budget with

Monolithic REINFORCED Concrete

Keep the cost of your highway structures down by designing for reinforced concrete. Recently published cost figures for 14,703 federal aid bridges show that 2 out of 3 bridges were constructed of reinforced concrete at an average of approximately *$350.00 less per lineal foot* than bridges constructed with other materials. On your next project, investigate this lower cost construction material and compare its savings.

Concrete Reinforcing Steel Institute
38 South Dearborn Street
Chicago 3, Illinois



9-61

THE YOUNGER VIEWPOINT

Committee on Younger Member Publications

Walter D. Linzing, Chairman; 4751 No. Paulina, Chicago 40, Ill.

Zone I	Zone II	Zone III	Zone IV
Donald Kowtko 289 Foxhill Road Denville, N. J.	Russel C. Jones 2020 Delaware Avenue Pittsburgh 18, Pa.	William R. Walker 4600 Franklin Ave. Western Springs, Ill.	Judd Hull 6000 S. Boyle Ave. Vernon, Calif.

[*This month's editor is Walter D. Linzing, chairman of the Committee on Younger Member Publications.*]

Stimulus to interest

Taking the bull by the horns, the Associate Members of the Pittsburgh Section have tackled the problem of drawing local engineers together and stimulating greater interest in Section activities. Starting with an analysis of the situation and following through with a comprehensive plan, they have achieved some very promising results that could benefit other Sections throughout the Society.

"The Younger Viewpoint" is indebted to Roy F. Johns, president of the Associate Member Forum in Pittsburgh, for taking time to explain in detail how the individual engineer in the Pittsburgh area is being induced to attend meetings that emphasize our common bonds as civil engineers, and how an appeal directed at the human and professional relationship is paying off dividends in greater attendance at meetings. Mr. Johns' stimulating letter follows:

Committee of Twelve launches study

"Today we are faced with a variety of difficulties in stimulating interest in Society activities. We of the Pittsburgh Associate Member Forum, like all member organizations, are competing with the extravaganza of the modern world which allows little time to weigh one important thing against another. However, it seemed to our Forum that the scale had always been out of adjustment in the matter of attendance at our meetings. Thus, two years ago a twelve-man committee was appointed to find out why.

Search for common interests

"The task of pinpointing the cause was studied from the viewpoint: What is necessary to promote effective group action? The preponderant thought was that we must appeal to our common bond. But this common bond can take many forms, depending on what level of Society activity we are working in. We realized that the term "Civil Engineer" itself was enough to bind us together into a national society which had its basic strength in accumulating and distributing a wealth of technical information and services. Local Society action, however, it seemed to us, took on a different perspective when talking about a common bond. Was it possible at local level—where engineering careers vary from management, to design, to construction, to education, to research—to have a common interest in the technical phases of each and every field. Yet our meetings had been specifically technical in the past.

"Trying to emphasize technical meetings at local level seemed to be one of our major problems. The framework of our common-bond analysis indicated the necessity of first getting those engineers who comprise the working membership into bodies of working human relationships. We wanted 'Pete Smith' to be able to call 'John Doe' by his first name and to take a warm personal interest in John as a human being first, and then as an engineer. It was important that we strengthen these human relationships.

Professionalism as a common bond

"But what was the common bond needed to stimulate interest and strengthen human relationships among members at the local level? The common bonds seemed to be professionalism, age, economic status, and social interests. The factors were of concern to all, regardless of our individual technical endeavors. Since we are not a social organization, special emphasis was placed on professionalism as the foundation of our common-bond structure. However, the bonds of age, economic status, and social interests were important, too, for it is the sum total of all ties that bind that make for group action. This meant choosing for our local meetings topics that would appeal to our common interests in order to promote better attendance and help strengthen human relationships. The accomplishment of this purpose would broaden both our professional and technical horizons.

Making the plan work

"We are by now aware of what was required to bind our group together, and we were confronted with the formidable task of making it work. Simple? No, this required much work and planning. Our first attempt was to organize our general meetings so that they would strengthen the bonds of our human and professional relationships. The best way to present this is to summarize briefly what we have done in the past, and what we plan to do in the future.

"In the past two years we have had several meetings which tried to appeal to our common interests. Among them were informal smokers, and discussion of topics such as "Management Evaluation of Young Engineers," "How the Young Engineer Can Get Started in Private Practice," "Legal Aspects of Engineering Problems," "Financial Opportunities," "Land Development" (panel of contractor, engineer, lawyer), and two outstanding annual dinners which included wives, a cocktail hour and entertainment. This year we are planning meetings in the following areas: Informal smokers, and sessions on such topics as "Self Appraisal and Re-evaluation" (the speaker—a psychologist), "The Professional Challenge" (panel of doctor, lawyer and engineer), "Biology and Engineering" (the technique of applying engineering principles to the workings of the human body), and an annual dinner similar to the ones in the past.

Results

"We have been successful in stimulating attendance and, much more important, we have a nucleus of men bonded together in their human relationships despite their broad differences technically. With this nucleus, we hope to subscribe to the principles set forth with special emphasis on making and improving human relationships. Our growth has been accelerated and should be still more rapid, as the enthusiasm aroused is passed on to each new member.

Problems

"Do we have our problems? The fact is that we face serious problems in communicating the need for strengthening our human relationship to the membership at large. We must plan for intensive education to overcome this weakness. Financing has also proved to be another problem, though not insurmountable. Increased spending for informed speakers and the atmosphere required to make a meeting a success are the primary reasons for our financing problem.

Anticipate future needs

"I would like to suggest that young engineers glance at two outstanding professions which perhaps are more consolidated professionally than ours, Medicine and Law, and I ask: On the professional level and at the local meetings of the Bar and American Medical Association, do you find these meetings technical, or are they geared to stimulate group action and human relationships? It is imperative that we look toward the future, anticipate our needs, and remedy those needs before they become problems!"

R B&W tells of new economies in structures bolted with A325 bolts

RB&W is presenting results of its cooperative shop bolting surveys to technical groups like the meeting of a major steel fabricators' association pictured above.

The surveys show that two A325 bolts, two nuts and two washers substituted for three regular high-strength bolts, three nuts and six washers in bearing-type connections give up to 40% savings in fastener costs alone. On top of this, they confirm the substantial increase in productivity through bolting.

But many engineers and architects lose the economic advantage of the new ASTM A325 bolts. Why? During the discussion period that followed the above talk, fabricators pointed out that structural designers are still using the old specifications instead of applying the latest Research Council specifications for joint design.

Many fabricators themselves don't fully realize the economy of A325 bolts in bearing-type connections allowing lower bids on structural jobs.

Since 1954, RB&W has pointed out technical-economic advantages of high-strength bolts over rivets. Now, large-head, short-thread A325 structural bolts make possible even greater economies. They mean savings in connecting and construction costs, more competitive steel structures, buildings that go up faster to produce income sooner, and industrial plants that better withstand vibration. It's up to you to put them to work.

Write for a copy of technical bulletin HHS-1. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

R B&W
117th year

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Sales office and warehouse at: San Francisco, Calif. Sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas. Sales agents at: Cleveland; Milwaukee; New Orleans; Denver; Fargo.

LARGEST INDEPENDENT PRODUCER OF HIGH STRENGTH BOLTS FOR CONSTRUCTION

Texas' 352 miles of Interstate awarded to concrete promise big savings in upkeep!

Across Texas, these modern concrete highways are steadily growing in length. They will long be a public reminder of the skills and dedication of the engineers and builders who are creating them.

A solid future is built right into roads like these. Only concrete has load-bearing strength that can be matched *mathematically* to future traffic needs. Only concrete enables engineers to design pavements to last 50 years and more.

Concrete isn't flexible, so there are no "moving parts" in it to cause hidden wear. And even with the highest temperatures, it won't soften and ripple under traffic. Concrete can't oxidize. There's never adverse chemical reaction to sun, cold, air or moisture. Concrete actually grows stronger year by year.

All these advantages mean extra thrift for Texas as it builds with concrete: Exceptional pavement life . . . upkeep costs that run far less than for asphalt. It's for reasons like these that most Interstate mileage across the nation today is going to concrete.

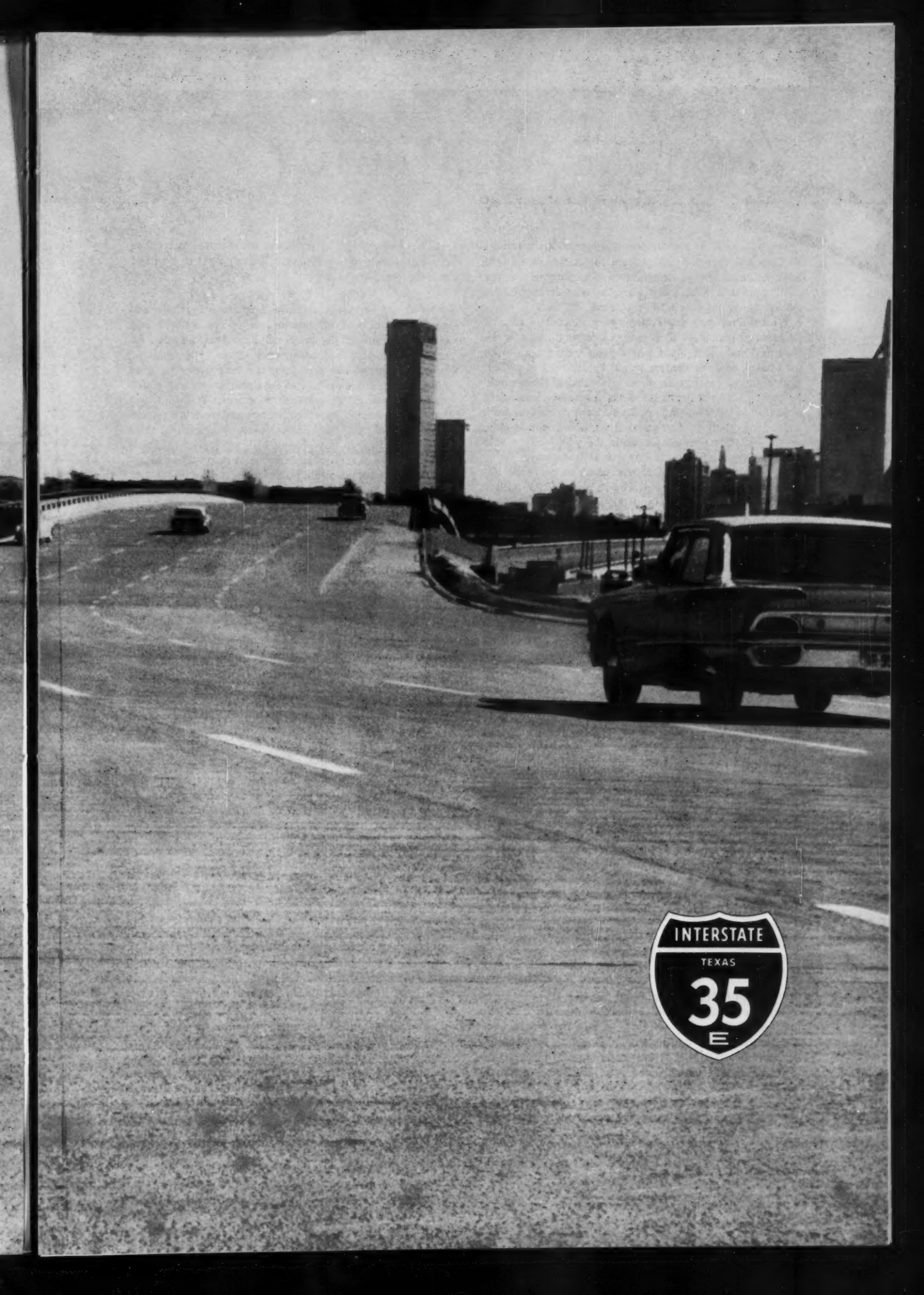
At right: Texas Interstate 35E, Stemmons Freeway out of Dallas.
Below: Texas Interstate 20, Dallas—Ft. Worth Turnpike.

38% maintenance saving with concrete, Texas' 31-year records show!

Official Texas State Highway Department records give the facts: Since 1929, road maintenance costs per mile per year for concrete have averaged $144.68; for asphalt, $235.23. Texas' new concrete highways will do even better!

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of concrete


INTERSTATE
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BY-LINE WASHINGTON . . . . .

The huge ($47 billion) **defense appropriations** approved by Congress carry an added item for engineers and the construction industry: something close to $200 million for civilian air-raid shelters that would be considerably different from anything previously projected.

With the military departments now in control of civil defense, the plan is for shelters in public buildings, schools, factories, and other areas where people congregate—not for homes. And the shelters would be designed to protect against fallout rather than direct hits. Most of them would be constructed in existing buildings. There was immediate objection to the plan (though it didn't get anywhere) from women members of Congress: Housewives, presumably, would be subject to danger while their husbands would have shelters available downtown or at the factory.

Other **money bills** had moved along in more or less normal fashion as August neared its end: $629.9 million for the Executive Offices and the Department of Commerce, the Panama Canal, and other agencies; $724 million for the Federal Aviation Agency; $568.9 million for the General Services Administration; $1.6 billion for the National Aeronautics and Space Agency; $4.9 billion for the Veterans Administration.

Much of great interest to engineers and to the construction industry will be passed over when **Congress goes home.** Included in the category of things untouched or unfinished, for instance, will be: The $1 billion, 10-year oceanography program; the various measures to establish "wilderness" areas in the West; moves to set up special classifications for engineers and other professional employees of the government; proposals for establishment of the metric system as a national system of measurement; proposals for establishment of a "National Science Academy"; establishment of anything like a "Department of Urban Affairs" or a "Department of Transportation."

There's much more: New water resources legislation; the naming of a "Public Works Coordinator" to assist the President and Congress by collecting and reviewing construction proposals of the various departments and agencies; a pay raise for consultants to federal departments; tax relief for the self-employed; labor legislation—such as permission for common-situs picketing; and extension of the Davis-Bacon Act to private companies engaged in building privately financed structures that will be used by the federal government. Of course, the 15,000 bills in the Congressional hopper do not "die." Since the 87th Congress has a two-year life, anything not acted upon this time goes over, intact, to January.

* * *

The **Post Office** is going ahead fast with its program of getting new buildings built by private interests, then leasing them for a period of years. In fact, the program has been accelerated—the department hopes to let contracts for 2,409 such jobs (272 are modernization projects) before the end of the calendar year. Since the middle of February, 1,267 contracts, for $85.2 million, have been let under this program. The program is somewhat similar to the lease-purchase plan abandoned by the General Services Administration some years ago, but with a significant difference: the Post Office has an option to buy the buildings, but doesn't guarantee do do so, after the leasing period is up. The reason is that the Post Office must move with the population, doesn't want to tie itself to a location permanently.

* * *

New and stringent **Defense Department regulations** governing the business activities of retired military and civilian government personnel will have a serious effect on many engineering and construction firms. The result of heavy Congressional prodding, the new rules (1) prohibit "selling" by an officer to the department from which he retired, within two years of retirement; (2) civilian and regular personnel, including retired and reserves on extended active duty, may not use military or civilian titles in connection with any commercial enterprise; (3) "selling" is defined very completely, covers practically any transaction with the military departments. Reserve officers not on active duty may be exempted.

* * *

Discovery of a 1-million-cu ft **"cavern"** under the famed Lincoln Memorial (by Iowa's Rep. Fred Schwengel, a self-styled "Lincoln nut") touched off a furor of speculation as to its purpose, and suggestions from Schwengel that the huge space be converted into a museum for Lincoln memorabilia. The entire area directly under the building, and extending under the impressive front steps is in fact hollow—supported on enormous concrete pillars more than 60 ft high—a situation known to the National Parks Service, but to few others. There's no great mystery actually: Examination of plans followed by the George A. Fuller Co., which started building the memorial in 1913, indicates that engineers didn't trust the uncertain river-side soil, took caissons down to rock 30 ft or more below, then carried the concrete columns up to support the edifice at proper height.

One outgrowth of Schwengel's proposal for an underground museum: A commission studying a possible memorial to President James Madison (to be built on Capitol Hill) said it would study a proposal to provide a two-block-square underground vault in the proposed memorial, as storage space for the Library of Congress.

* * *

A study of **aircraft noises** at **selected airports** will be conducted by the Federal Aviation Agency this year (under a contract with a private firm). Data obtained will be used to assist airport authorities, zoning commissions and others interested in aircraft-noise abatement procedures. Studies will be made at Washington's National Airport, New York's Idelwild and Baltimore's Friendship airports —and others yet to be named. The FAA hopes to have the study completed by November.

* * *

The trend toward **federal intervention** in state affairs was never clearer than in the terms of the Northeastern Water and Land Resources Compact, passed by the house in early August. The six-state compact would have no regulatory or similar powers, would only collect information, propose overall plans and the like. But the federal government would name seven of the thirteen members of the compact commission, and since the states would be represented by only six commissioners—the states could easily be outvoted.

Helicopter service courtesy Coast Rotors.

"Electrotape Leapfrog" – world's fastest surveying

"Electrotape Leapfrog" slashes days, weeks, and even months from the time once required to make precise distance measurements. Required to play: a helicopter and a pair of Cubic DM-20 Electrotapes. Order of play: 1. Helicopter flies Electrotape #2 from start point to first tie-point, up to 30 miles away. 2. While Electrotapes measure distance to first tie-point, helicopter flies back to start point. 3. Helicopter flies Electrotape #1 to second tie-point, leapfrogging first tie-point. 4. While Electrotapes measure distance between first and second tie-points, helicopter flies back to pick up Electrotape #2. And so on. Leapfrogging eliminates packing-in through difficult terrain, saves clearing underbrush. Priced at $6000 apiece, Electrotapes quickly pay for themselves by saving operating time and cost. Weighing only 25 pounds, the DM-20 is all-transistorized and provides numerical distance readout. For descriptive literature on Electrotape, write to Department CE-104.

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INDUSTRIAL DIVISION
SAN DIEGO 11, CALIFORNIA • ROME, ITALY

This mark tells you a product is made of modern, dependable Steel.

Spring Scene...

with a hidden message for those who design, build and maintain busy streets

There's more to this picture of Washington, D.C. in early April than meets the eye. It's what you *don't* see that makes this scene so significant.

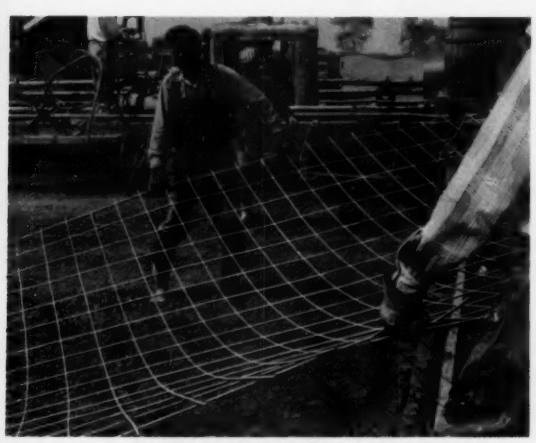
Paved streets in Washington is what this message is all about. Its purpose is to show you how *good* city streets or county roads can look after a hard winter . . . *before* the repair crews have gotten around. The reason you don't see gaping cracks, potholes and other types of roadway damage usually found after a long, hard winter is because over 600 miles of portland cement concrete street pavements in Washington (serving either as a concrete base for asphalt topping or conventional surface pavement) have been specified and built with welded wire fabric steel reinforcement.

Steel reinforced concrete pavements perform efficiently under constant stop-and-go rush hour conditions as well as under the hi-speed pounding of heavy thruway traffic. They last longer. They cost less to maintain because they have far fewer joints and all cracks are held tightly together.

Welded Wire Fabric adds 30% more strength to concrete pavement slabs. This is achieved because the steel reinforcement distributes the load transfer and reduces stresses in the slab by about 30%, thus diminishing the pavement's tendency to develop cracks, and prevents the progressive opening of any cracks which do occur. Reinforced pavements provide a safe, smooth riding surface that lasts.

Today USS American Welded Wire Fabric is stronger than ever. Minimum tensile strength is now 75,000 psi. Minimum yield strength is 60,000 psi. A 100% machine-fabricated product—ready for immediate placement—it is available in weights, gauges and dimensions to your exact specifications. For more information, contact our nearest Sales Office, or write direct to American Steel and Wire, Room 1275, Rockefeller Building, Cleveland 13, Ohio.

USS and American are registered trademarks



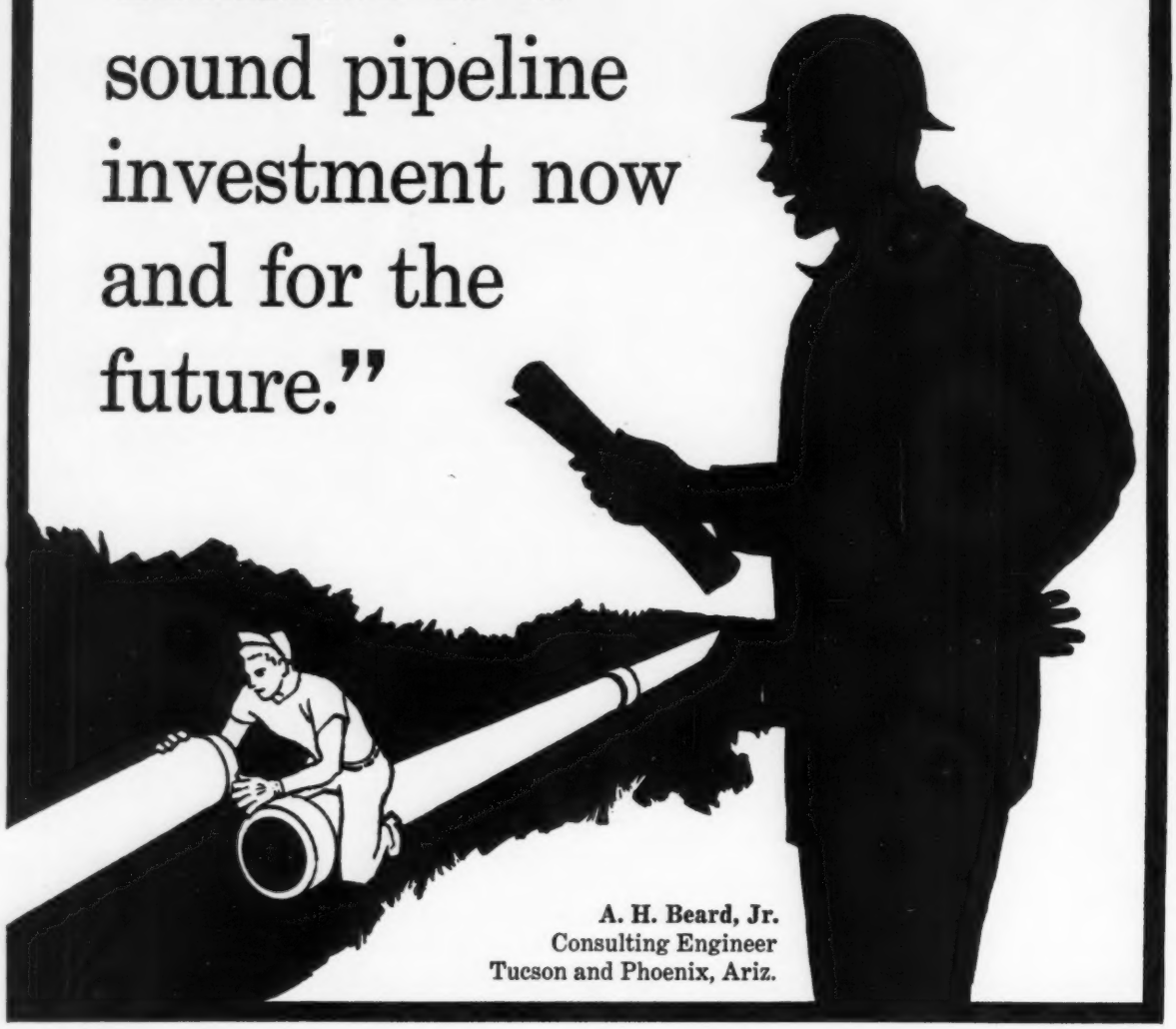
Workers place sheet of 50-lb. welded wire fabric on a freshly poured concrete base which will later be topped with asphalt.

American Steel and Wire Division of United States Steel

USS

An engineer from Arizona reports:

"Transite is a sound pipeline investment now and for the future."



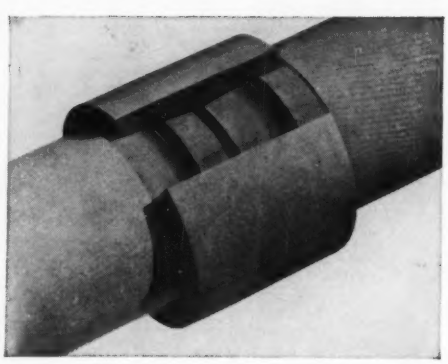
A. H. Beard, Jr.
Consulting Engineer
Tucson and Phoenix, Ariz.

"When considering a pipe material for water and sewage projects, 'value' analysis plays an important part in our choice. One of the main questions is whether the pipe will perform reliably now *and* in the future with cost advantages to the client.

"Experience has shown that Johns-Manville Transite® Pipe offers the value we seek. It has proved reliable and at very favorable costs. In addition to savings in handling and installing, Transite's unique Ring-Tite® joints assure that leakage tests will not upset job costs. In numerous tests, Transite lines have regularly been under the 'allowable' specification.

"Installations as old as Transite itself show this pipe outstanding under flexure, crush and hydrostatic conditions. Lengths of Transite excavated here in Arizona for tests showed no signs of internal corrosion after 20 years of dependable service."

For full details, write to Johns-Manville, Box 362, CE-9, N. Y. 16, N. Y. In Canada: Port Credit, Ontario. Cable: Johnmanvil.



JOHNS-MANVILLE JM PRODUCTS

MACOMBER ALLSPANS

PROVEN PERFORMANCE— ASSURED QUALITY

Nailable cold rollformed Macomber Allspans offer performance proven by hundreds of load tests of full-size Allspans taken at random from our production lines—quality assured by full-time Pittsburgh Testing Laboratory inspectors, backing up our own inspection forces. All this, plus the 15 years experience in cold rollforming and unequaled research record of Macomber—originator of the open web steel joist.

Architects and engineers who want the best in open web structural framing will find the Macomber story interesting. Our local Sales Representatives can give you the details, or if you prefer, send us the attached coupon for your copy of the Allspan Design Manual.

Summary reports of Macomber Allspan load tests are also available upon request.

THESE MACOMBER PRODUCTS HAVE BEEN PRODUCED UNDER CONTINUOUS RESIDENT INSPECTION PITTSBURGH TESTING LABORATORY

MACOMBER
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ALLSPANS • V-LOK • V-PURLINS
BOWSTRING TRUSSES • ROOF DECK • STRUCTURAL STEEL

Find Your Local MACOMBER Representative in the Yellow Pages

SEE OUR CATALOG IN SWEET'S OR WRITE FOR COPY

Free 28-page construction reference manual

- Dimensions
- Properties
- Load Tables
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Please send me your ALLSPAN Design Manual

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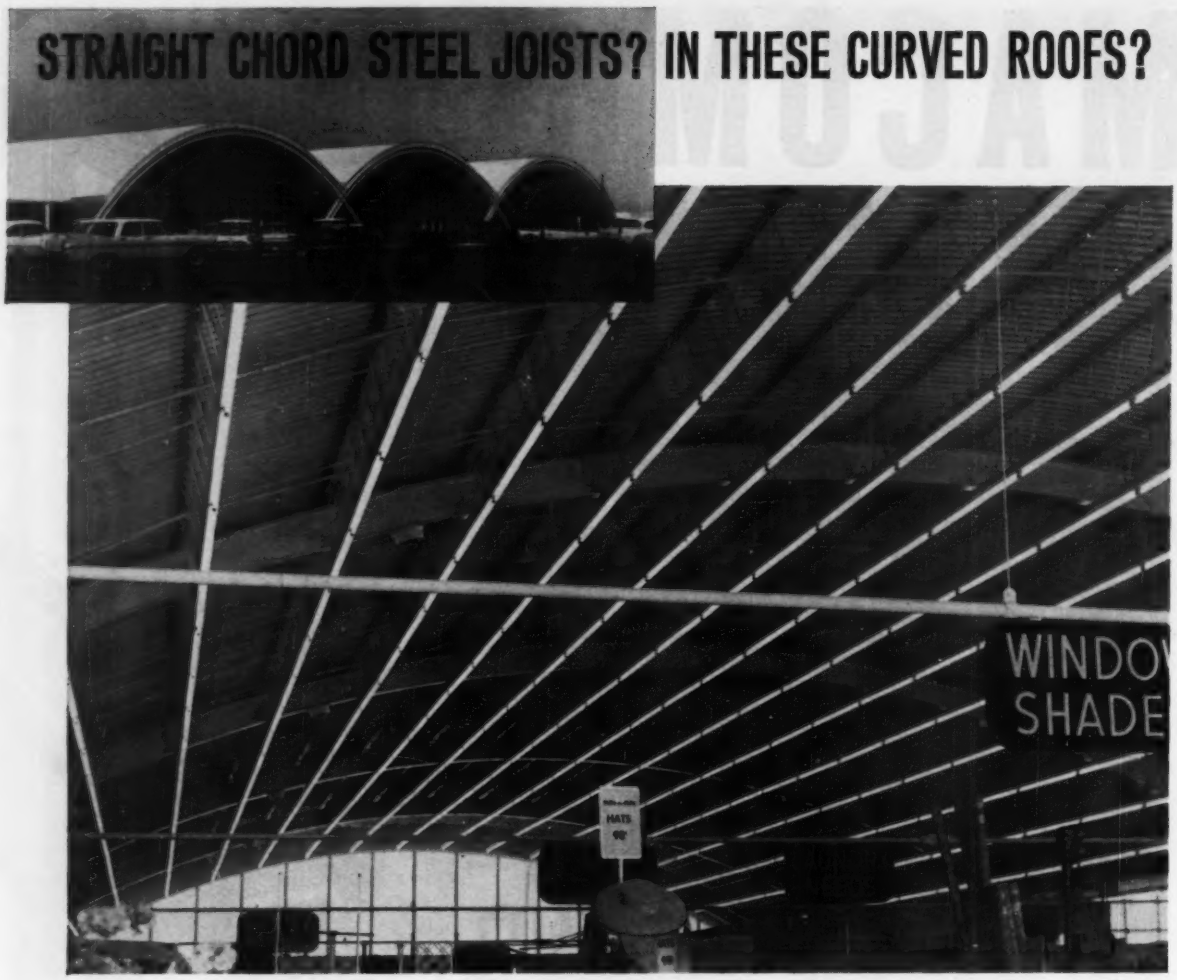
CE-619

STRAIGHT CHORD STEEL JOISTS? IN THESE CURVED ROOFS?



They were used here—with economy and efficiency!

One of the biggest advantages of Laclede Open Web Steel Joists is their versatility—their adaptability to practically any architectural style.

Here's an example: the interesting new store recently opened by Central Hardware Company, biggest and best known retail hardware chain in the St. Louis area. It was designed by Schwarz and van Hoefen, and built by Alport Construction Co., both of St. Louis.

Notice how the joists were set longitudinally across the arched I-beams, forming a strong, lightweight, firesafe base for the cylindrical arches. Observe another practical little touch: the fluorescent lighting tubes attached to the bottom chords of the joists for the entire depth of the store.

No matter in which style you design or build, you'll find many time-saving, cost-saving uses for versatile Laclede Open Web Steel Joists.

STEEL JOIST INSTITUTE MEMBER

LACLEDE

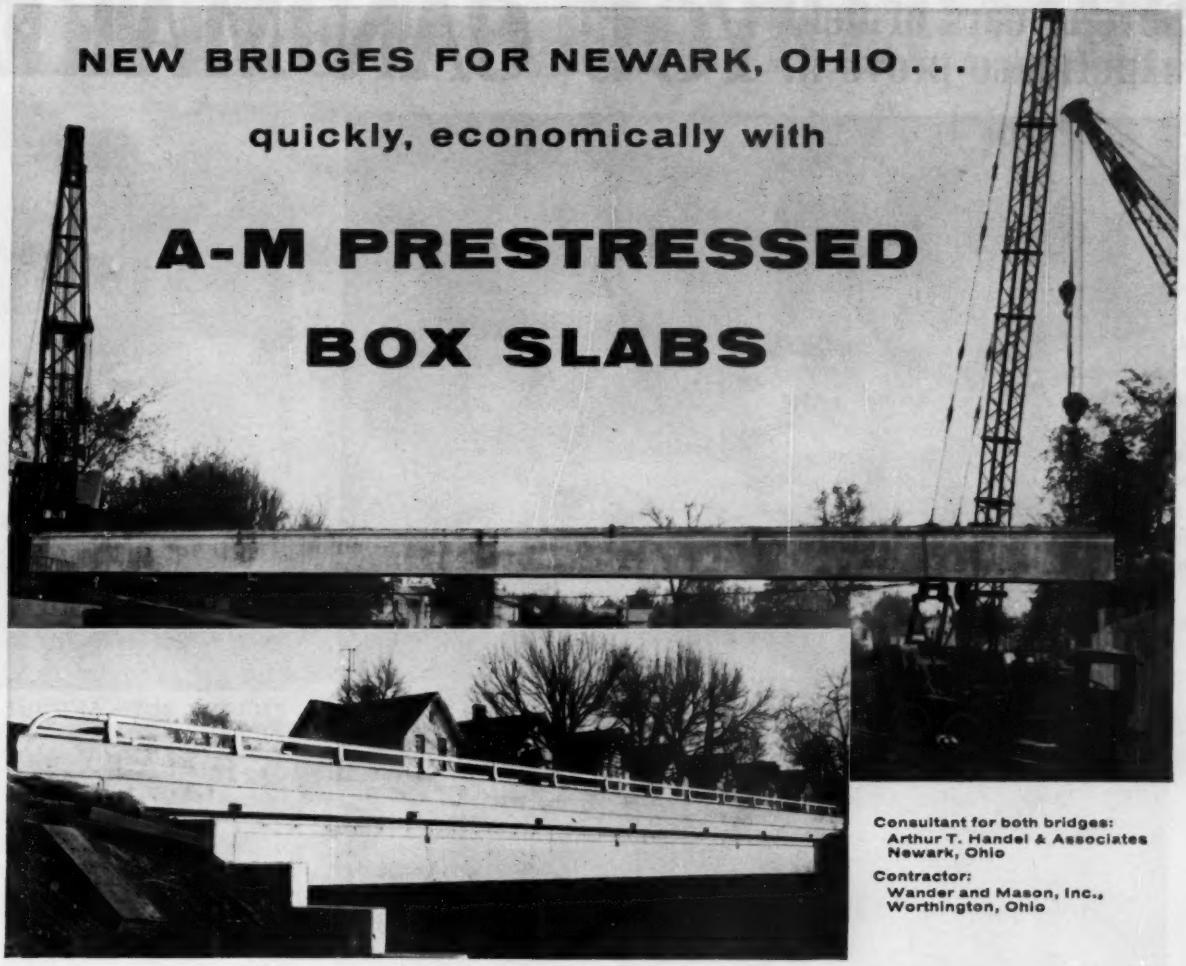
LACLEDE STEEL COMPANY

SAINT LOUIS, MISSOURI ◆ Producers of Steel for Industry and Construction 6133

NEW BRIDGES FOR NEWARK, OHIO . . .

quickly, economically with

A-M PRESTRESSED BOX SLABS



Consultant for both bridges:
Arthur T. Handel & Associates
Newark, Ohio

Contractor:
Wander and Mason, Inc.,
Worthington, Ohio

The 106′ composite box slab being positioned, above, is the first of 16 precast concrete units in the new Eleventh Street Bridge erected for Newark. Each deck member is 48″ deep by 48″ wide, weighs 54 tons, and was pretensioned with straight strand using a bond retardant.

The completed, 112′ Wilson Street Bridge—also erected for Newark—is composed of ten 48″ square composite box slabs. This bridge was constructed in only two days despite extreme weather conditions and a heavy snow.

The prestressed concrete slabs were shipped from American-Marrietta's Columbus, Ohio plant to Newark by rail, transferred to trucks and trailers with two 25-ton hydraulic jacks, and hauled three miles from siding to job site.

Both installations replace steel truss bridges and were constructed in record time with considerable savings of labor and expense.

A-M®

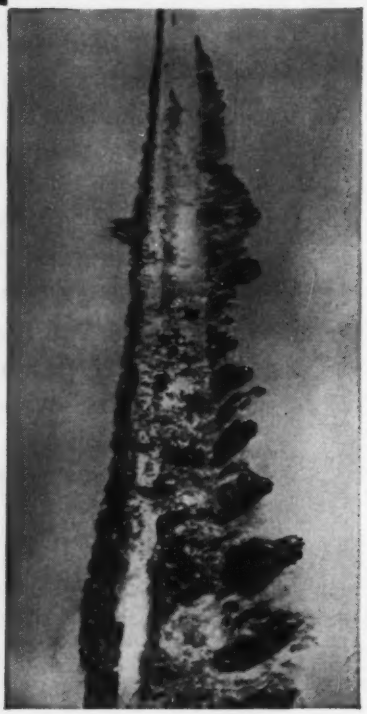
AMERICAN-MARIETTA COMPANY
CONCRETE PRODUCTS DIVISION
GENERAL OFFICES:
AMERICAN-MARIETTA BUILDING
101 EAST ONTARIO STREET, CHICAGO 11, ILLINOIS, PHONE: WHITEHALL 4-5600

Seven years of field experience prove it! YOU CAN MAKE

BROKEN ABUTMENTS: Restored stronger than new by brushing on polysulfide-epoxy adhesive to rejoin old concrete, or to bond fresh concrete to old.

FILLING RUTS AND DIPS. Adhesive and aggregate mixed in ratio of 1 to 5 is spread and troweled right over depressed area. No digging down to roadbed or exposing steel reinforcements.

SPALLED JOINTS: Repaired in two hours by using polysulfide-epoxy mixed with aggregate as trowelable compound. Reduces tie-up time as much as 48 hours.



FASTENING TRAFFIC MARKERS. Fixed to road surface with polysulfide epoxy adhesive alone, lane strips have stayed rigidly in place for long periods of time.

LITTLE OF BIG REPAIRS

...with concrete adhesive based on THIOKOL liquid polysulfide polymer

Two chemicals in combination, THIOKOL liquid polysulfide polymer and epoxy resin, are providing one of the most useful engineering tools of our time.

Together, they produce a brushable, quick-cure adhesive used to join old or fresh concrete to old...to bond skid-proofing materials to roadways...to seal and protect surfaces against chemical attack and water seepage. The resultant bond is stronger than concrete itself, waterproof, acid resistant, and flexible enough to withstand repeated freeze-thaw cycles.

Repairs which heretofore required days of labor and road down-time, the use of heavy equipment and large crews of men are now being completed at a fraction of the cost in time, manpower, material and dollars. Serviceability of such repairs is, by actual experience, proving more satisfactory than those achieved by conventional methods.

Want to know more about this new engineering material? How it's used? Where it's used? The benefits and economies that accrue? Write to Thiokol for brochure CA-200.

POT HOLES: Repaired to featheredge and ready for traffic in as little as three hours when patched with mortar mix of polysulfide-epoxy, sand or aggregate.

HAIRLINE CRACKS: Filled with polysulfide-epoxy. Adhesive film sprayed or brushed over surface seals out water, checks further deterioration.

SCALED AREAS: Repaired in only a few hours with adhesive containing THIOKOL liquid polysulfide polymer. Bonds new concrete to old. Watertight bond stronger than concrete itself.

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Gentlemen: Please send me your Brochure CA-200 dealing with concrete adhesives applications and methods.

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Built faster ...earned $112,000 extra ...with STEEL

STEEL framed buildings really go up in a hurry—three stories per week in a typical apartment house.

Faster construction with steel means earlier completion, earlier rentals—extra income that would *never* be achieved with slower forms of construction.

Look at the *extra* bonus steel achieved on this 21-story, 700-room luxury apartment house in New York City.

Steel framing shortened the building time and speeded occupancy by two months.

The owner says this meant:

$112,000 in additional rental income.

For that extra bonus . . . use **STEEL.**

American Institute of Steel Construction
101 Park Avenue, New York 17, N. Y.

Owner-Builder—Senville Realty & Construction, Inc.
Architect—Schuman & Lichtenstein
Structural Engineer—Charles Mayer

Steel *Steel* **STANDS** *for the future* AISC

Armco 50C Flap Gate, 60-inch diameter

NOW!

Armco Flap Gates for water control are fully adjustable after installation

Armco Flap Gates now have new design features that permit even delicate adjustments after they have been installed—without disassembly.

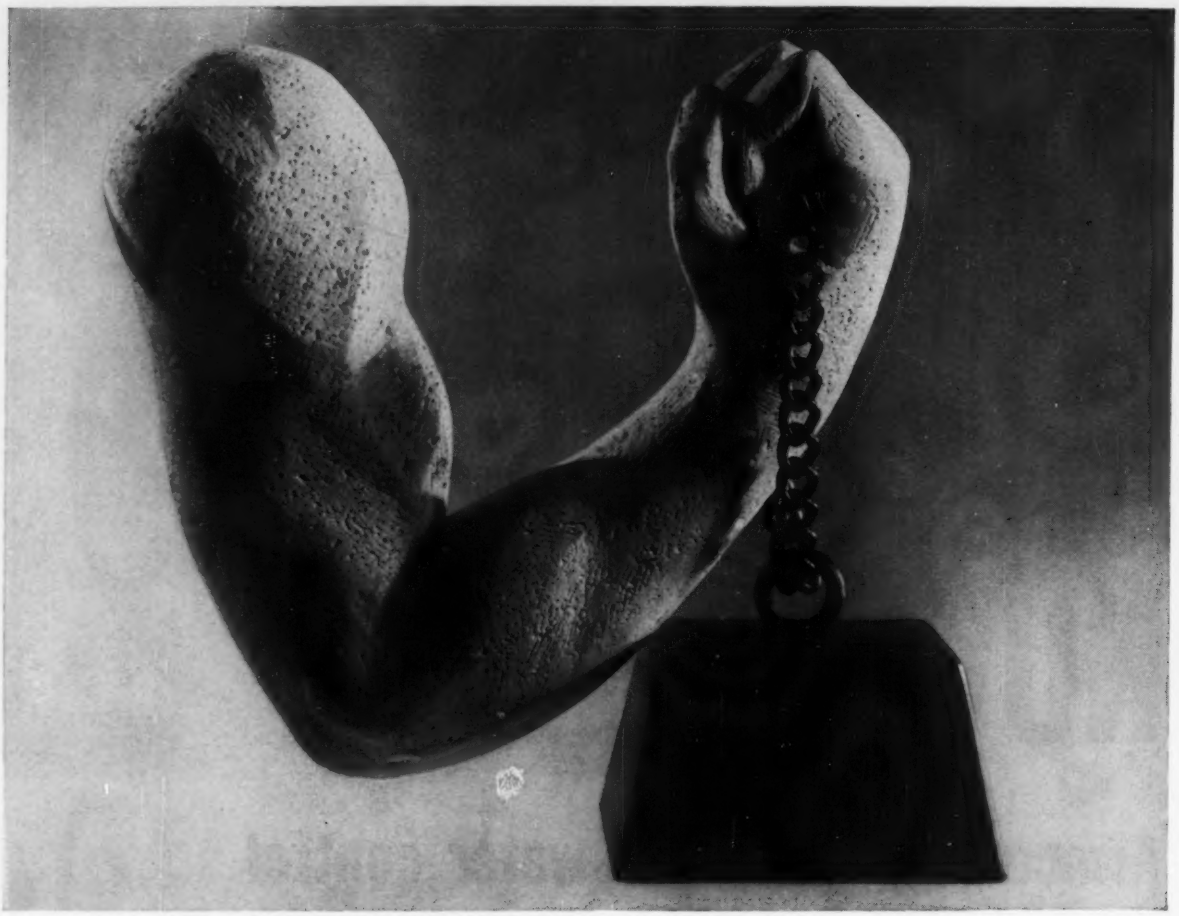
Because these gates are equipped with new kinds of continuous studs, plus cast iron lugs and hinge arms, the two pivot points can be moved laterally from the wall to adjust the sensitivity of the gate. They can also be used to correct any slight misalignment in installation. Then too, extended ends of the links have set screws to permit further adjustment of the flap to the frame.

These cast iron Flap Gates are designed for 20- or 50-foot seating heads. Choice of spigot or flat back; cast iron or bronze seating faces; diameters range from 4 to 84 inches.

For more information on Armco Gates—flap, sluice, slide, roller, or radial gates—write us. Armco Drainage & Metal Products, Inc., 6311 Curtis Street, Middletown, Ohio. Write for addresses of Armco International offices overseas.

Detail of hinge arm mechanism

ARMCO Drainage & Metal Products



Increase concrete strength 30% with J-M Placewel

... the liquid admixture that gives you 5 key controls of concrete

Placewel®, a product of Johns-Manville, world's largest industrial user of portland cement, permits a new high in compressive and flexural strength. This superiority has been proved in millions of yards of concrete.

Placewel is a water-reducing, dispersing agent *plus* a catalyst. It is available with or without an air entraining agent. Placewel, by breaking up the cement flocs, releases water for lubrication that isn't normally available. Thus, mixing water requirements are cut without relying on air entrainment alone. The Placewel catalyst enhances the strength-gaining characteristics of portland cement. This unique combination of properties provides a 30% increase in concrete strength (see chart).

Less than three ounces of Placewel per sack of cement will also –

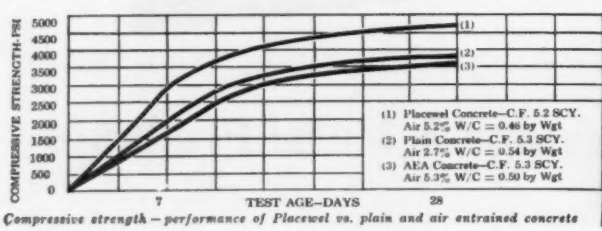
- Increase durability 350%
- Increase workability
- Improve dimensional stability
- Reduce permeability

J-M Retardwel® is recommended when concreting conditions require longer placing and finishing time. Retardwel delays the initial set of concrete and yet provides higher 24 hour strength.

Architects and engineers the world over have learned that Placewel and Retardwel give them complete control over the concrete they specify. For full information and technical assistance write: Johns-Manville, Box 325 New York 16, N. Y.

JOHNS-MANVILLE
Celite Division

JOHNS-MANVILLE JM PRODUCTS



Compressive strength – performance of Placewel vs. plain and air entrained concrete

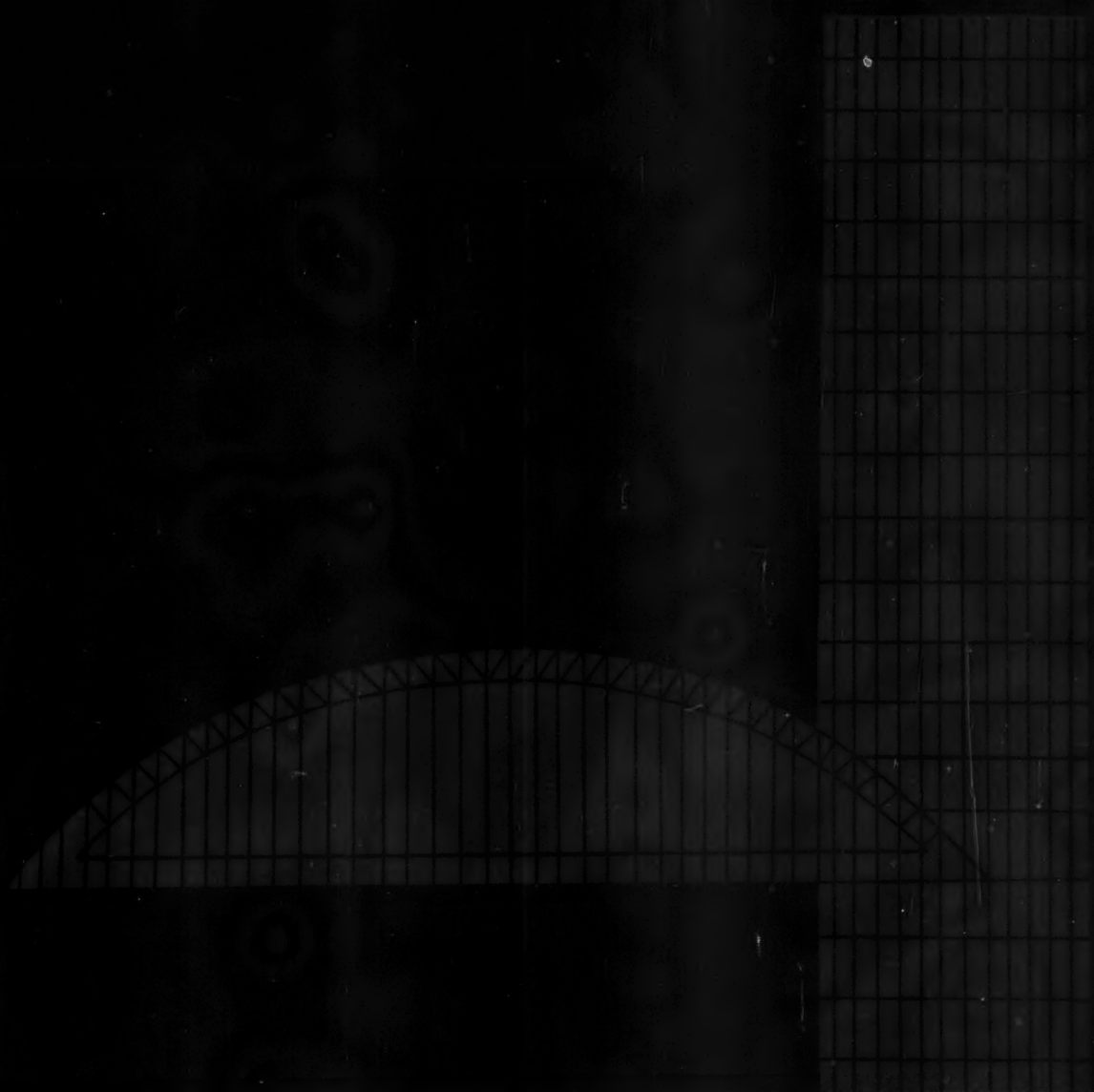
Take a good look at what you can do with the complete family of USS Design Steels

Over the past 50 years, the steel industry has developed at least 10,000 new steels! Many of these steels have been proved thoroughly on the job and wait only for the design magic of the right engineer, the right architect or the right designer to put them to use in stronger, safer and more economical structures.

Designers of buildings and bridges now have a whole "family" of USS Structural Carbon Steels, High Strength Steels and Constructional Alloy Steels available in the necessary shapes with minimum yield points ranging from 32,000 psi to 100,000 psi.

Several bridges and buildings have already been built combining these various steels into one structure to obtain maximum strength, light weight and economy—but all kinds of interesting developments lie ahead. It should be a challenge to designers to get the most out of every steel!

USS United States Steel



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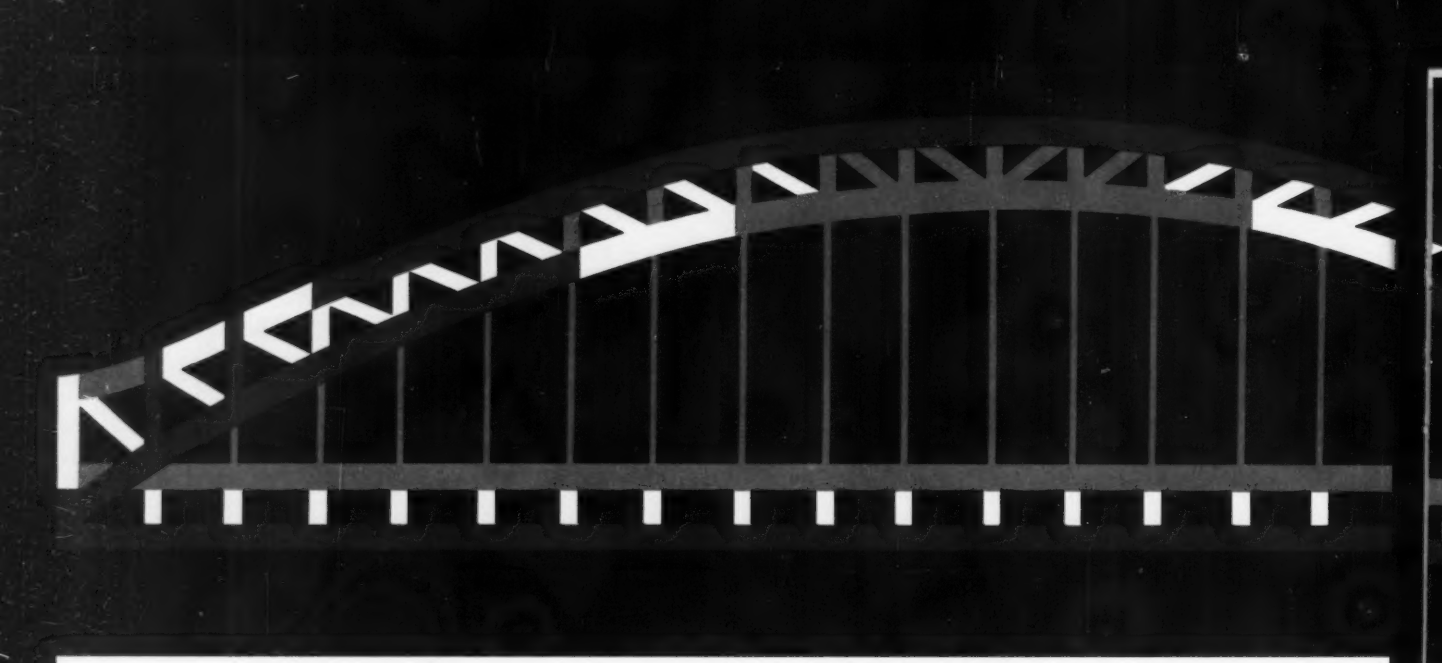
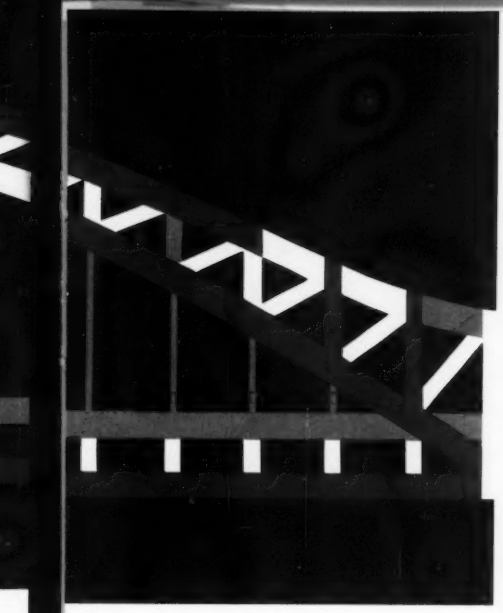


New concept of design for buildings and bridges—get the most out of the family of steels by using them wherever they will improve design, reduce weight or effect over-all savings in construction.

USS Design Steels that do the most to reduce construction costs

This mark tells you a product is made of modern, dependable Steel.



Red—USS "T-1" Constructional Alloy Steel (100,000 psi minimum yield point)

White—USS MAN-TEN High Strength Steel (ASTM A440—50,000 psi minimum yield point)

Gray—USS Structural Carbon Steel (ASTM A36—36,000 psi minimum yield point or A7—33,000 psi minimum yield point)

Pound for pound, these stronger steels shoulder heavier loads . . . or they reduce the size and weight of structural members and foundations. They add valuable floor space to buildings, reduce freight costs and result in faster erection with earlier occupancy . . . all money-saving advantages.

New design concepts are emerging that challenge the designer's imagination and ingenuity. The combining of many steels to get the most out of them has long been practiced by automotive engineers and some other designers. It has given us the best automobiles, the highest television towers in the world, the largest earth-moving equipment and giant radio telescopes.

ASTM A7 Structural Carbon Steel is a mighty versatile and potent metal. No other material so strong (minimum yield point 33,000 psi) and selling at a material cost of less than 10 cents a pound, can be drawn, welded, forged, riveted, punched, and painted so readily and safely. A more weldable carbon steel (A373) has a minimum yield point of 32,000 psi.

ASTM A36 Structural Carbon Steel. The higher yield point of 36,000 psi and the low price indicate that this important new steel may become the predominant structural grade, and that it may displace A373 in welded construction. A36 steel gives the designer the opportunity to provide lighter-weight structures at a low cost. It has been accepted for both building and bridge construction at a basic allowable design stress 2,000 psi higher than A7 steel (20,000 allowable design stress for bridges, 22,000 for buildings). It can be used for riveted, bolted and welded fabrication.

USS High Strength Steels

All have minimum yield points of 50,000 psi. Each has specific area applications where it will do the very best job.

USS MAN-TEN Steel (A440) is a high-strength carbon steel intended for riveted and bolted construction. It is the most economical of the high-strength steels; has good workability, high resistance to abrasion, and atmospheric corrosion resistance double that of plain carbon steel. Since it provides a yield point 50% higher than A7 steel, engineers can design with higher unit working stresses and achieve *real* reductions in steel size, weight and costs.

USS TRI-TEN Steel is a high-strength low-alloy steel intended primarily for use in welded construction. This steel meets all requirements of ASTM A441. It provides greater toughness, even at low temperatures, and has twice the atmospheric corrosion resistance of carbon steel. TRI-TEN Steel has been widely used for bridges, buildings, machinery and railroad equipment to reduce weight and costs or to provide increased strength and load capacity without increased weight.

USS COR-TEN Steel is recommended for all applications in which relatively high resistance to atmospheric corrosion is considered necessary. It permits the use of thinner sections to take advantage of the increased strength of the material, or the use of equal or heavier thickness for extended life *with or without protective coating.* Paint lasts up to twice as long on COR-TEN Steel as it does on carbon steel.

USS "T-1" Constructional Alloy Steel. This is the "superman" of structural steels with a minimum yield strength of 100,000 psi. It is furnished quenched and tempered and is readily weldable. It has four to six times the atmospheric corrosion resistance of structural carbon steel and possesses exceptional toughness over a wide range of temperatures down to −50°F. "T-1" Steel combined with USS TRI-TEN High-Strength Low-Alloy Steel and carbon steel has already been used in a number of bridges. In Carquinez Strait Bridge in California, it saved $800,000 with big savings in weight. This led to its use in Martinez Bridge nearby, Louisville-New Albany, Whisky Creek and others under design. "T-1" Steel is available in standard structural shapes as well as bars, semi-finished and sheets.

USS "T-1" type A Constructional Alloy Steel. This is a lower-priced steel with the same high yield strength of 100,000 psi in thicknesses up to 1 inch. It can be used in highly stressed members to obtain maximum strength, with reduced size, weight and costs. It is available in the same shapes as "T-1" Steel.

For more information on any of these USS Steels, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS, "T-1," MAN-TEN, TRI-TEN, and COR-TEN are registered trademarks.

United States Steel Corporation • Columbia-Geneva Steel Division • Tennessee Coal & Iron Division • United States Steel Supply Division • United States Steel Export Company

United States Steel

USS

Now Available...

QUENCHED AND TEMPERED STRUCTURAL SHAPES

in such grades as "T-1", "T-1" type A, 9% Nickel and HY-80 Constructional Alloy and Armor Steels

Announcing another industry "first" for United States Steel—USS Quenched and Tempered Alloy and Armor Steel Structural Shapes are now commercially available for the first time anywhere, in the types and sizes shown in the accompanying tables. The more commonly used sizes of Wide Flange Beams, American Standard Beams, Channels, Equal Angles and Unequal Angles will be produced in these USS Steels: "T-1", "T-1" type A, 9% Nickel, HY-80 and certain other alloy grades that provide desirable mechanical properties after quenching and tempering. Later, other sizes and shapes will be added according to demand.

These quenched and tempered alloy and armor steel structural shapes (see table below) can simplify design and result in substantial weight savings, increased structural strength and reduced shipping and handling costs. For a free folder about any of these steels or their structural shapes, contact your local USS representative or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. USS and "T-1" are registered trademarks.

United States Steel Corporation • Columbia-Geneva Steel Division • Tennessee Coal and Iron Division • United States Steel Supply Division • United States Steel Export Company

Availability Quenched and Tempered standard structural shapes are available in the following shapes and sizes:

I	Beams: 8″ to 16″ inclusive	Selected Wide Flange Sections and Foot Weights*
I	Beams: 6″ to 12″ inclusive	American Standard Sections and Foot Weights*
[	Channels: 6″ to 15″ inclusive	American Standard Sections and Foot Weights*
L	Equal Angles: 3″ to 8″ inclusive	Standard Sections*
L	Unequal Angles: 3½″ x 3″ to 8″ x 6″ inclusive	Standard Sections*

*See our booklet, "USS Shapes & Plates," ADUCO-27001

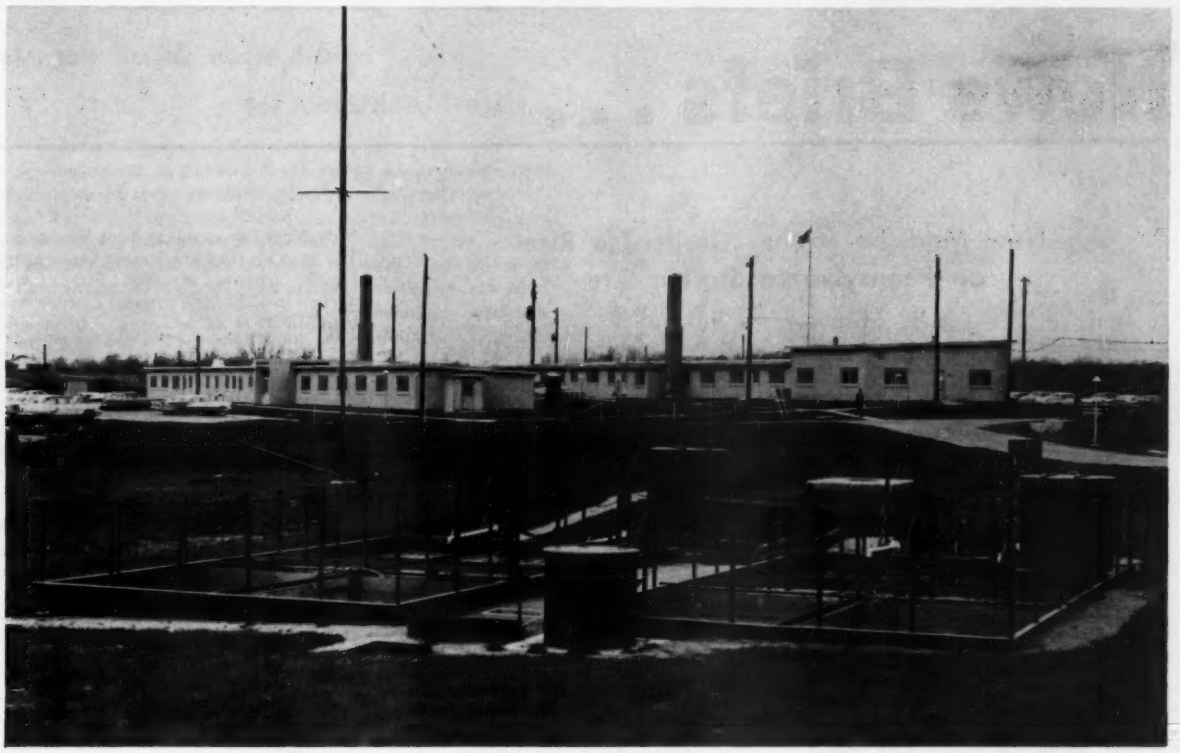
Maximum length 40′ for all sections

Mechanical Properties of Quenched and Tempered Alloy and Armor Steel Structural Shapes

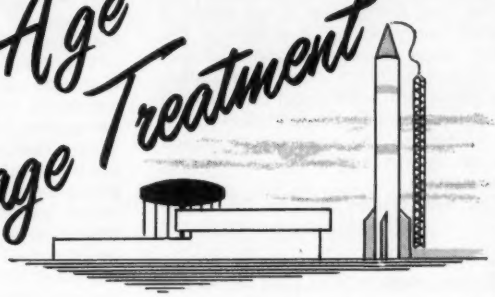
	Yield Strength, psi	Tensile Strength, psi	Elong. in 2″, % min.	Reduction of Area, % min.	Longitudinal Charpy Impact (when specified)	
					Keyhole	V-notch
"T-1" Steel 2½″ and Under	100,000 min.	115,000/140,000	18	55①	15 ft.-lbs. @ −50F	30 ft.-lbs. @ +10F
"T-1" type A 1″ and Under	100,000 min.	115,000/140,000	18	55①	15 ft.-lbs. @ −50F	—
Grade A 9% Nickel	60,000 min.	90,000 min.	22% min.	—	15 ft.-lbs. @ −320F	20 ft.-lbs. @ −320F
Grade B 9% Nickel	65,000 min.	95,000 min.	20% min.			
HY-80 ¼″-2″ Incl.	80,000/100,000②	—	19①	—	—	70 ft.-lbs. @ −120F

①¾″ and under—45% min.
②½″ and over, yield strength range is 80/95,000 psi
③½″ to 2″ inclusive, elongation 20% min.

United States Steel



Space Age Sewage Treatment



ABOVE: Dual "Oxigests" provide a total capacity of 47,500 gallons per day to serve this large, outlying military installation. The treatment facility is equipped with comminutor, foam control system, sludge storage tank, chlorine contact tank, hydrochlorinator housing and weir box.

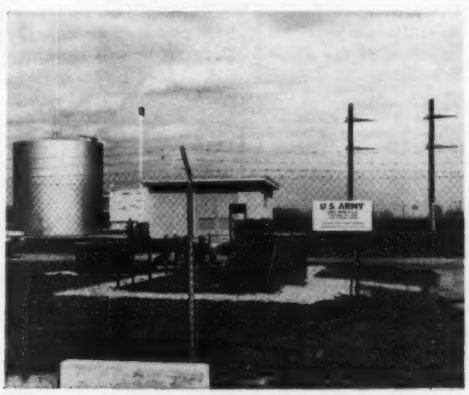
BELOW: Single installation of 18,750 gallon "Oxigest" sewage treatment plant, with same equipment as above, serves a smaller military site.

S&L

These Smith & Loveless "Oxigest" factory-built sewage treatment plants are representative of many such installations serving military posts and civilian developments throughout the United States and Canada.

For small communities, shopping centers, apartments, mobile home parks, schools, motels, factories, and growing subdivisions—in outlying areas where there is no municipal sewage treatment system, the "Oxigest" provides dependable sewage treatment. The long-period "Aerobic Digestion" treatment process of the "Oxigest" provides maximum treatment efficiency with minimum maintenance.

Smith & Loveless "Oxigest" sewage treatment plants are available in a variety of sizes . . . in factory-built units that are delivered to the job site, ready for installation, and in large, field-erected units for capacities to 5,000 persons. — **Address: Department 80**



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(2860)

News Briefs . . .

New Madison Square Garden to Rise on Pennsylvania Station Site

A new $75,000,000 Madison Square Garden Sports and Entertainment Center will be built over Pennsylvania Station in mid-Manhattan, according to an announcement by the Graham-Paige Corp., owner of the present Madison Square Garden, and the Pennsylvania Railroad. The architectural firm of Charles Luckman Associates, which made the engineering feasibility studies, is now preparing detailed drawings for the Center. The 3,500,000-sq ft Center will be one of the largest single construction projects in the nation.

Actually the new Center will replace the present Pennsylvania Station, which was completed in 1910. However, special construction and demolition techniques will be utilized to permit operation of the station during the construction period. Present station facilities include 21 tracks, running 14 miles over 28 acres (from Sixth to Tenth Avenues), two tunnels under the Hudson River, and four tunnels under the East River. These facilities carry 652 trains a day.

At the completion of construction an all-new Penn Station will occupy the concourse-level areas. For greater efficiency it will have six double units of escalators distributed around its perimeter instead of the single pair now in use.

The new project will also include a new, larger Madison Square Garden with seating capacity for 25,000, a 4,000-seat auxiliary arena and roof-top ice palace; a 28-story, 850-room hotel; a 34-story commercial building; and peripheral shopping areas. The lower floors of the commercial building will provide parking facilities that are expected to accommodate most of the demands of the area. Supporting members for the Center will be achieved by 400 new or reinforced existing columns carried down to rock below track level.

The new Madison Square Garden will be one of the largest convention halls in the United States and the largest column-free arena in the world. It will consist of radial reinforced-concrete cantilever ribs, rising upward and outward to support the seating and terminating in an elliptical concrete compression ring at the top. The saddle shape of the arena roof and ceiling is said to assure excellent acoustics. The arena floor will be steel framed, with a concrete-slab floor, supported by transfer girders to the substructure station column system carried down to rock foundations.

The new Garden will be the fourth New York structure to bear the name. The present Madison Square Garden, on Eighth Avenue at 50th Street, was opened in 1923. The original Garden was build in 1874 at Madison Avenue and 27th Street.

Artist's sketch of new Madison Square Garden Center, which will be built on the site of Pennsylvania Station in New York. The site of nearly nine acres and air rights over station facilities and tracks will be acquired from the railroad on a long-term lease. The present station, built in 1910, will be replaced by a new and more efficient structure. Station services will be provided as usual during razing and rebuilding. Construction of the $75,000,000 complex will start next year and require two years for completion.

Hyperion Test Plant to Reclaim Waste Water

A plan for reclaiming waste water will be tested during the next two or three years by the Los Angeles Board of Public Works and Prof. Albert F. Bush, M. ASCE, of the University of California at Los Angeles. The pilot facility, now ready for operation at the Hyperion Treatment Plant, will be the test laboratory for a process to purify sewage water so that it can be reused for filling artificial lakes and fire-fighting reservoirs in the Los Angeles area. Reclaimed waste water has long been used for the lakes and irrigation systems in San Francisco's Golden Gate Park.

The proposed process—developed at the university by Professor Bush—involves the use of algae ponds to lower the salt and bacteria content of sewage water. This method adds a third purifying treatment to the two now used at the Hyperion plant, where waste water from homes and industry is treated by sedimentation and oxidation before discharge into the ocean. Although the water is permanently lost to users in Los Angeles and other Southern California communities, the two purifying treatments are necessary to prevent beach pollution. Professor Bush expects to prove that with one additional treatment most of the 280,000,000 gal of waste water lost each day could be saved.

Waste water carries about 600 ppm of dissolved salts. By cutting this salt content to about 450 ppm through algae, the water can be used again, according to Professor Bush. At the pilot plant, algae will be grown in a U-shaped pond, 200 ft long and 20 ft wide. Their growth will be encouraged by the addition of carbon dioxide from engine exhaust gas.

Some of the treated waste water from the Hyperion plant will be channeled to the algae pond. After the algae have picked up the salt ions, they will be removed, and the purified water piped to a tank for study and analysis. The pilot plant will process about 100 gal of pure water a minute.

According to Professor Bush, "the process is much cheaper than trying to purify either sea or brackish water, and it calls for a much smaller investment in new plants and distribution systems."

Oregon Builds High Bridge for Coastline Crossing

Work progresses on Thomas Creek Bridge under construction high above the rocky coastline of southern Oregon, near Brookings. The 848-ft structure, being built by the Pacific Coast Division of the Bethlehem Steel Company, will be the highest bridge in the state, its truss span supported by two steel towers, rising 300 ft above concrete piers on the canyon floor. As work progresses from the south abutment, the bridge is supported by falsework towers and 106-ft cantilevers to permit erection of the third falsework tower. During the winter, frequent heavy rains, fog, and high winds hampered construction, and five 30 x 48-ft manila safety nets were suspended beneath the workmen. The new bridge is part of an Oregon State Highway Commission project that will eliminate a tortuous, 37-mile stretch of Highway 101 between Brookings and Gold Beach. The new highway hugs the scenic coastline, and will shorten driving time between the two points by half an hour.

Housing Starts in June

Construction was started on 136,000 housing units this June—a rise from the 130,600 units begun in May, though a slight drop in housing starts is normal for the May-June period. By even more, the June total exceeded the 128,000 units begun in June of last year. After seasonal adjustment, private housing starts were up 9 percent over May in the Northeast, down 6 percent in the North Central States, virtually unchanged in the South, and up 23 percent in the West.

Estimates are from the Bureau of the Census of the U.S. Department of Commerce.

Hawaii to Have Large Prestressed Concrete Plant

The largest prestressed concrete plant in the Pacific area was completed, recently, at the plant of the United-Pacific Concrete Corporation, Honolulu. The new plant will produce prestressed concrete building and bridge members, including 8-ft double tees, 5-ft double tees, joists, beams, girders, octagonal and square piles, flat slabs, light poles, AASHO Standard bridge girders, and a variety of other precast and prestressed members.

The new prestressed concrete facility will have five independent prestressing beds, several of which will permit the simultaneous casting of several lines at one time. Live steam will be piped underground to each bed to permit the most efficient, rapid curing of the products to achieve maximum strength. The prestressing plant was designed by Rockwin Engineers, Los Angeles, prestressed concrete consultants.

In addition to prestressed concrete products, United-Pacific will produce a full line of concrete pipe.

National Congress on Environmental Health

Some 200 leaders in industry and public health attended the recent Second National Congress on Environmental Health, held at the University of Michigan in June. Groups cooperating in the congress were the American Public Health Association, the National Sanitation Foundation, the University of Michigan, the National Advisory Council of the Public Health Service, and the Paper Cup and Container Institute.

In a leading talk Abel Wolman, F. ASCE, professor of sanitary engineering at Johns Hopkins University, told the group that those who hope for complete elimination of domestic and industrial waste from land, water, and air are not realistic. Even if waste could be completely eliminated, according to Dr. Wolman, "other less obvious threats would emerge." To meet the challenge of pollution, he advocated competent group appraisal of real and apparent health hazards of various environmental factors, and suggested that intensive effort be made to develop suitable methods of analyzing "exotic chemicals."

Dr. Wolman also recommended an authoritative look at the criteria for health and safety. In the environmental field, he warned, standards developed in the past five years contain many inconsistencies. "Errors in technology frozen into law are difficult to eliminate at a later date," he added.

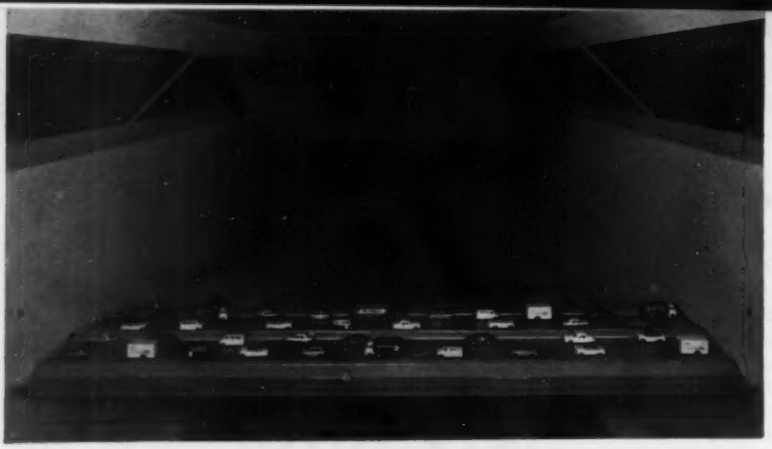
In the area of radioactive waste, Walker L. Cisler, president of Detroit Edison, predicted that nuclear electric power stations will be operating competitively in some areas by 1968, and that in a decade after that atomic power plants will be familiar sights almost everywhere.

Chicago Starts Large Housing Development

The Chicago Housing Authority has commenced construction on what will be the city's largest housing project. The development, to be known as the Robert R. Taylor Homes, will contain 4,415 units. It will be built on 95 acres of reclaimed blighted land between State Street and the Rock Island Railroad Tracks, from 39th to 54th Streets.

Work is already under way on the initial phase of the project, which includes twenty apartment buildings, a management-maintenance building, a community center, and a heating plant. The residential buildings will be erected in U-shaped groups of three. Use of a combination of insulation and roofing, called All Weather Crete, for all roof areas is expected to result in considerable saving over conventional methods of insulation and roofing.

The designer is Shaw, Metz and Associates, and the general contractor Gust K. Newberg.



Experiments in the wind tunnel at Britain's National Physical Laboratory on the aerodynamic stability of this model of a section of the proposed Severn Bridge in Western England permitted the solution of problems of design. The laboratory carries out a wide range of tests which are invaluable to science and industry.

Civil Engineering Research in England

Research at Britain's National Physical Laboratory at Teddington, Middlesex, England, covers a host of practical problems encountered by civil engineers. The following item on some of the research investigations being carried out at the laboratory was prepared by William Lowndes and made available by the British Information Services.

When the laboratory was opened at the beginning of the present century, its objectives were defined as "the standardization and verification of instruments, the testing of materials, and the determination of physical constants."

Today the laboratory is probably still most widely known for its work on the accurate measurement of physical quantities. However, its scope has increased enormously in recent years, and now about 80 percent of its work is devoted to basic and applied research into a host of practical problems—problems that vitally affect science and industry, commerce and transportation and even the everyday lives of ordinary people.

In the Aerodynamics Division, for example, investigations have recently been made of the suction forces on roofs due to wind. Many countries experience cyclones, and roofs of small domestic dwellings are frequently torn away by suction during these violent windstorms. Wind-tunnel tests on model houses may be used as an aid towards achieving a roof design that will resist cyclonic suction. A "hyperbolic paraboloid" design had been suggested for the purpose. In addition to its structural advantages, this type of roof can be produced from small quantities of low-grade timber, and is therefore cheap to make—an important consideration in some of the countries in which it may be used. Wind-tunnel tests showed that the addition of a 12-in. parapet would greatly reduce the roof suctions and lessen the possibility of damage from cyclones.

Suspension bridges are much more susceptible to oscillation than more rigid structures, and the laboratory has conducted some highly important tests in this area. Recent investigations have been carried out on designs for the proposed suspension bridge over the estuary of the River Severn in Western England, with eminently satisfactory results.

The consulting engineers for this project decided to break away from the conventional truss-type stiffening girder, and to adopt a more economical, sheeted-in box-type section. Previous experience had shown that it is generally unwise to present large, solid areas of the bridge span to the wind, and that a rectangular box section would thus be unsatisfactory. The shape of the outer edges of the box, however, was found to have a considerable influence on stability, and after a series of tests was run on rudimentary models with different shapes for the outer edges, a sectional shape was found that appeared to be acceptable from both the aerodynamics and structural standpoints.

This section, with a depth of only 10 ft, was incorporated in a proposed design for the bridge, and final tests made on accurate models confirmed its stability. Thus the consulting engineers were able to proceed confidently with their box-type section design.

Problems of stability also arise in the design of hovercraft, that ultra-modern form of transportation that moves over water on a cushion of air. In the Ship Division of the laboratory research is carried out on the shape of these vessels, their control and maneuverability and their motion over shelving beaches. This is an aspect of hydrodynamics research that may well have immense implications for the future.

The part played by the National Physical Laboratory in Britain's industrial and scientific progress is an extremely significant one. The laboratory constitutes an ideal focal point for basic and applied research in the fields of non-nuclear physics, and in our highly technological age its importance seems certain to increase even more.

Papers from Earthquake Engineering Conference

Proceedings of the Second World Conference on Earthquake Engineering—held at Tokyo and Kyoto, Japan, July 11-18, 1960—may now be ordered. The conference, which attracted experts in earthquake-resistant design from all over the world, was sponsored by the Science Council of Japan, with the cooperation of the Japan Society of Civil Engineers, the Architectural Institute of Japan, and the Seismological Society of Japan.

The three-volume set, priced at $15 postpaid, includes 120 papers and reports five vital sessions. Of special interest are the reports on recent destructive earthquakes in Iran, Morocco, and Chile.

Copies of the Proceedings may be ordered from the Far Eastern Book Sellers, Kanda P. O. Box No. 72, Tokyo, Japan. Payment may be made by check or through bank transfer of funds.

A committee of 28 members, one from each country represented at the conference, was appointed to act as an international body to promote the development and dissemination of information on earthquake engineering. John Rinne, F. ASCE, is the United States representative.

The First World Conference was held in San Francisco in 1956. It was organized by the Earthquake Engineering Research Institute, which has its headquarters at California Institute of Technology.

Earthquake Engineering Studied by UNESCO

Following a UNESCO team visit to ascertain the state of seismology and earthquake engineering in Southeast Asian countries, a seminar was held in Tokyo, July 18 to 26, to audit the team report and to draw up recommendations to be made to UNESCO. The seminar was attended by representatives of the governments of Japan, Korea, Taiwan, the Philippines, New Zealand, Indonesia, Vietnam, Laos, Burma, Thailand, India, Russia, and the United States. The U. S. representatives were Prof. Perry Byerly, of the University of California, and Prof. George Housner, M. ASCE, of the California Institute of Technology.

In addition to ways of strengthening seismology in the earthquake-prone Asian countries, the report recommended that strong-motion accelerometers and seismoscopes be installed in the strongly seismic regions; that building codes with earthquake provisions be adopted and enforced; that seismic zoning maps be

drawn up; that earthquake-resistant design be taught in the universities in these countries," that research on earthquake-resistant properties of native building materials be initiated; and that a regional training center for earthquake engineering and seismology be set up in Japan.

A similar UNESCO mission will visit the South American countries later this year, and a mission will be sent to the Mediterranean area in 1962.

Cost Estimate for Barkley Dam Reduced

A $17,000,000 reduction in the estimated cost of the multi-purpose Barkley Project on the Cumberland River (June issue, page 107) has been announced by the U.S. Corps of Engineers.

According to Col. Vincent P. Carlson, district engineer of the Nashville District, the current estimated cost of the project has been reduced from $183,000,000 to $166,000,000. Contributing factors are reported to be favorable bids on power plant equipment; planning and design modifications in the canal that will connect Lake Barkley with Kentucky Reservoir; more detailed planning for land acquisition and relocation work; and reduction in estimated overhead costs.

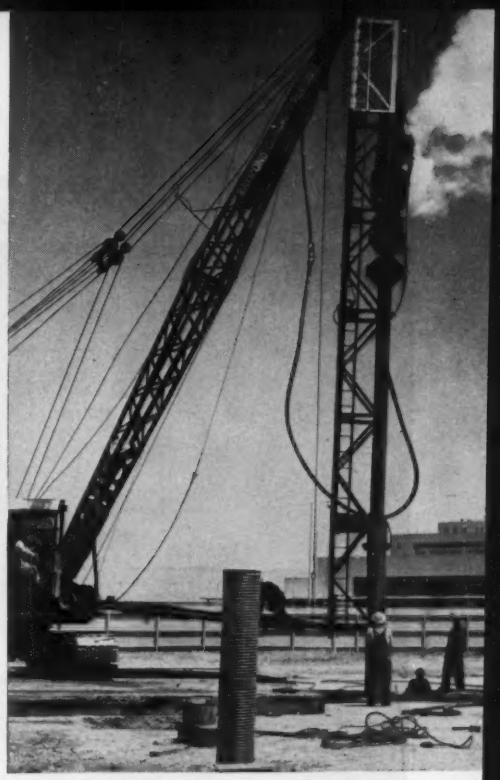
Construction of the project is approximately 30 percent complete, with planning well advanced on all features. The 150-ft-high dam will replace five existing smaller dams and will form a reservoir on the Cumberland River over 118 miles long, to be called Barkley Lake. An unusual feature of the project will be a connecting canal between Kentucky Reservoir on the Kentucky River and Lake Barkley, so that flow in either river may be regulated. It also provides a short-cut for navigation.

Construction Spending Rises Slightly in July

The value of new construction put in place in July amounted to $5.4 billion, according to preliminary estimates of the Bureau of the Census of the U.S. Department of Commerce. For the first time estimates reflect the revised higher level of private non-farm residential additions and alterations announced by the Census Bureau in June. The additions and alterations series has been revised to a new level, based on January 1959 prices, and is no longer comparable to data for earlier years.

On the new basis, the July construction total was 1 percent above June spending and 5 percent above the July 1960 level. Making up the July total were private construction expenditures of $3.7 billion (the same as June but up 4 percent from last July), and public outlays of $1.7 billion (an increase of 4 percent over June and of 8 percent over July 1960 levels).

At San Francisco International Airport



At San Francisco International Airport, the first pipe piling is being driven for a new $8,000,000 terminal building. The 685 pilings, averaging 100 ft in length, are being driven through filled land to bedrock by a huge steam-driven pile driver, operated by the Raymond Concrete Pile Company. After the pipe is driven its full length, a section of special corrugated shell (seen in the foreground) is attached to it, and the hammer continues driving the pipe to bedrock pulling the corrugated section with it. When completed in 1963, the 800-ft-long curved South Terminal Building will house passenger facilities for seven major airlines. A similar North Terminal Building, scheduled for completion in 1970, will round out a complex designed by Welton Becket & Associates, San Francisco architects and engineers.

Cumulative spending for new construction in the first seven months of this year amounted to $31.7 billion, compared to outlays of $30.9 billion in the same period of 1960.

Conference Held on Weights and Measures

Weights and measures officials from 35 states, the District of Columbia, and Puerto Rico attended the 46th National Conference on Weights and Measures, held in Washington, D.C., June 12-16, under the sponsorship of the National Bureau of Standards.

Speaking at the opening session, Secretary of Commerce Luther H. Hodges commented on the increased efforts being made by the National Bureau of Standards to extend and refine national standards of physical measurement. He emphasized the importance of such efforts to the country's economic progress and to its military and space programs, as well as to the advancement of science itself.

Of special interest to engineers was Secretary Hodges' announcement that the Department of Commerce has asked Congress to authorize a new Assistant Secretary of Commerce for Science and Technology. His function, he said, would be "to help . . . make the most intelligent use of the Department's various technical agencies, and to work with other government agencies and private industry to achieve more fully the benefits that can be derived from an estimated $14 billion now being spent annually for research and development." It is expected that the request will be granted.

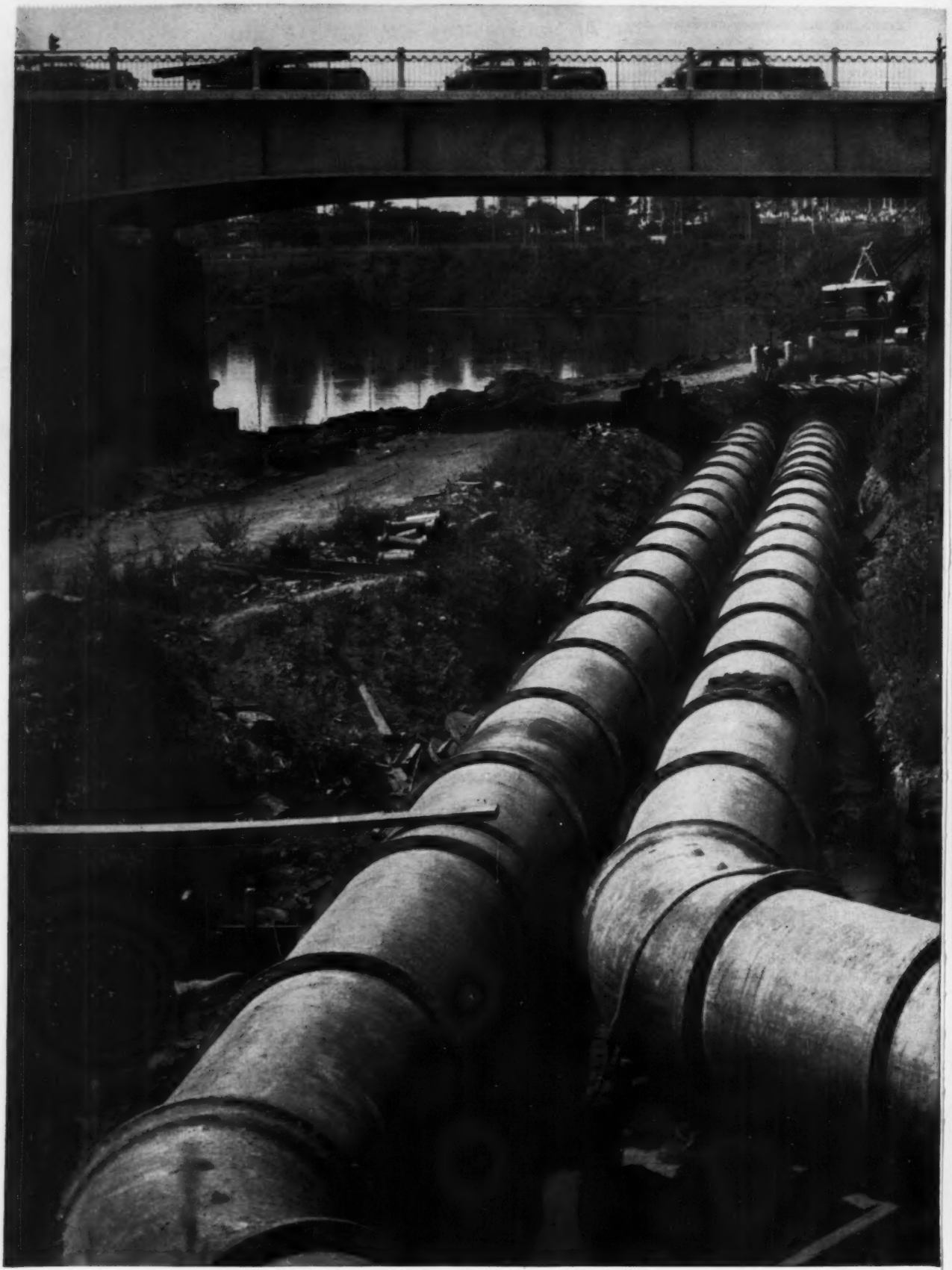
W. S. Hussey, of the National Bureau of Standards, reporting as conference secretary, summarized weights and measures activities of the Bureau and of the various states. Completely new weights and measures laws were enacted during the past year by Alaska and Tennessee, he reported, and numerous amendments to standing laws were enacted by several other states.

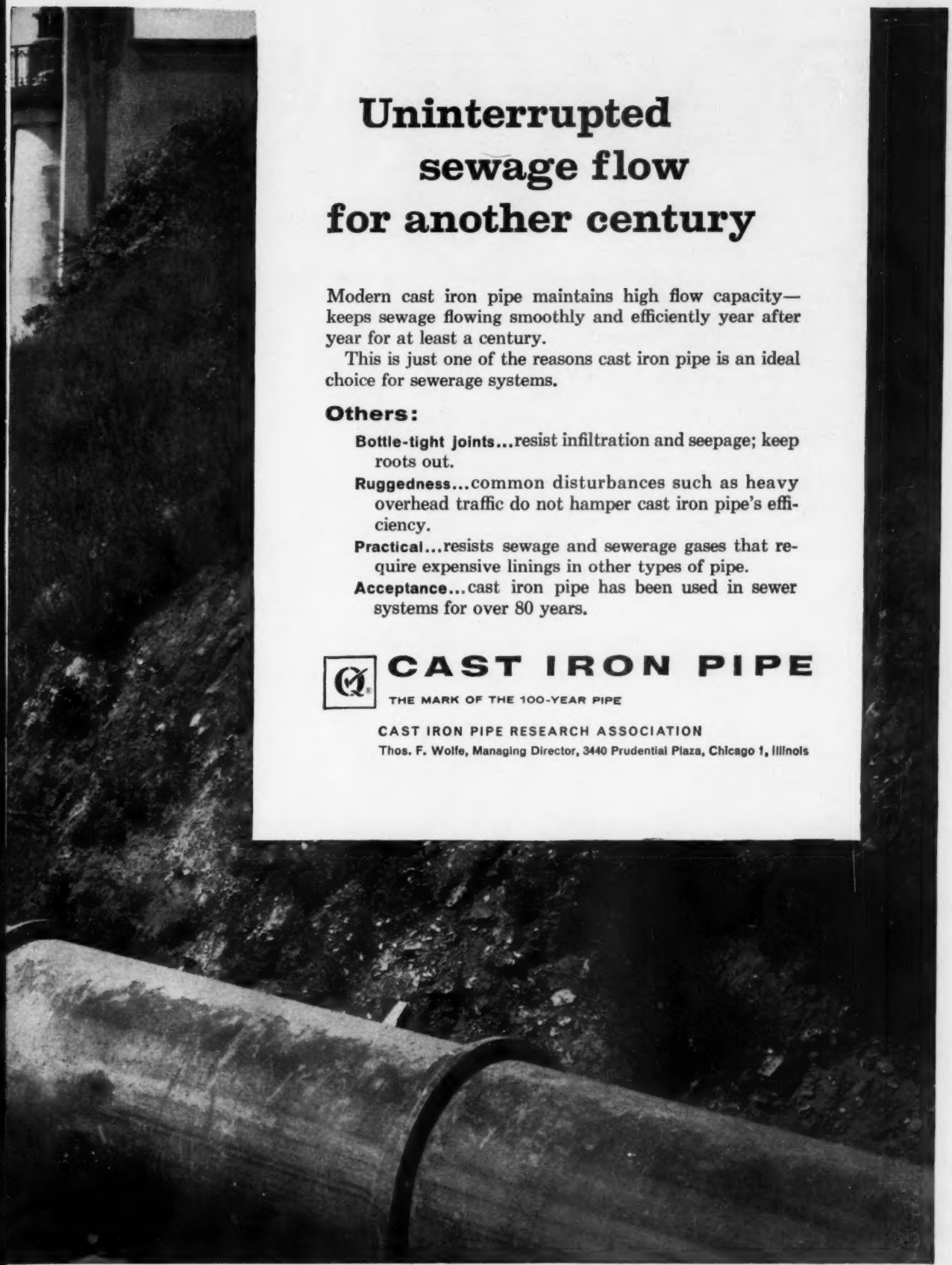
Philadelphia Engineers To Aid West Pakistan

The Kuljian Corporation, Philadelphia engineers and constructors, has been selected as consultant to the Water and Power Development Authority of West Pakistan to provide complete engineering services for a new multi-million-dollar electric power station at Quetta.

The new power facility, part of West Pakistan's long-range program for economic development, will create electric energy to provide irrigation for large areas of unproductive land in the Quetta region, to increase the output of coal mines that are only partly exploited, and to supply power to new industries planned for the region. The initial capacity of the station, to be known as the Quetta Thermal Power Station, is 15,000 kw.

The cost of the Quetta Station will be about $7,000,000. The Development Loan Fund of Washington, D. C., is assisting the project with a $6,000,000 loan.





Uninterrupted sewage flow for another century

Modern cast iron pipe maintains high flow capacity—keeps sewage flowing smoothly and efficiently year after year for at least a century.

This is just one of the reasons cast iron pipe is an ideal choice for sewerage systems.

Others:

Bottle-tight joints...resist infiltration and seepage; keep roots out.

Ruggedness...common disturbances such as heavy overhead traffic do not hamper cast iron pipe's efficiency.

Practical...resists sewage and sewerage gases that require expensive linings in other types of pipe.

Acceptance...cast iron pipe has been used in sewer systems for over 80 years.

CAST IRON PIPE

THE MARK OF THE 100-YEAR PIPE

CAST IRON PIPE RESEARCH ASSOCIATION

Thos. F. Wolfe, Managing Director, 3440 Prudential Plaza, Chicago 1, Illinois

PHS Reorganizes for Expanded Service

Establishment of a new Division of Environmental Engineering and Food Protection in the Public Health Service has been announced by Surgeon General Luther L. Terry. The new division, with Wesley E. Gilbertson, M. ASCE, as its chief, was created as part of a Service-wide reorganization designed to strengthen and expand present environmental health programs, and to provide more assistance to state and local health agencies.

Functions now assigned to the new division were formerly performed by the Division of Engineering Services, which has been abolished. These programs are concerned with basic problems in environmental health and sanitary engineering, primarily those of mounting concern to local agencies, particularly in urban centers. Included are a variety of general sanitary engineering activities.

For more efficient handling of public health problems created by environmental hazards, the Service has established an Office of Resource Development within the Bureau of State Services. Frank A. Butrico, F. ASCE, heads the new office, which will be primarily concerned with air and water pollution, exposure to radiation, and occupational and industrial developments.

Contract Awarded for P.G. & E. Plant Expansion

The Pacific Gas & Electric Company has selected the Babcock & Wilcox Company to manufacture and erect two radiant-type boilers for its Morro Bay (Calif.) station. Part of a $71,000,000 plant-expansion program, the two new boilers will power two 325,000-kw turbine generators, increasing plant capacity to 990,000 kw.

The Pacific Gas & Electric system, with a current rated capacity of 6,035,500 kw, serves about 40 percent of the population of Southern California. The new steam generators will go into operation in 1962.

Prestressed Concrete for Hotel-Parking Facility

A large hotel-parking facility is under construction at the Beverly Hilton, Beverly Hills, Calif. When completed, its capacity will be 1,500 cars.

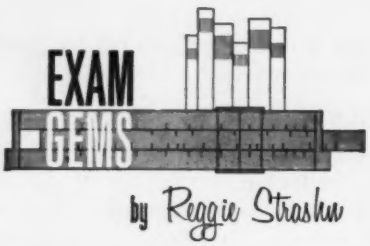
The project consists of erecting four new levels over two existing levels, with emphasis upon the use of prestressed concrete building members. No floor-to-floor shoring will be required at any time during construction—one of the economies permitted by prestressed concrete. All forming of poured-in-place closures will be accomplished by suspending the forms from the top. Holes will be cut in the existing slab, and five-story-high precast columns will be passed through the openings to rest upon new foundations.

The project architect is Welton Becket & Associates. Structural and prestressed concrete design is by Rockwin Engineers, and foundation design by Skinner & Stacy. All prestressed and precast concrete elements are being manufactured by the Rockwin Prestressed Concrete Corporation. The general contractor is Simkins & Perrin. Construction is scheduled for completion in late summer.

Engineer-Architect for Post Office Department

The U.S. Post Office Department has renewed its contract with Johnson & Johnson, Engineers-Architects, Inc., for engineering and architectural services in connection with the department's multi-million-dollar program. The firm has assisted the Post Office Department since 1958.

Johnson & Johnson have offices in Chicago and Los Angeles.



R. ROBINSON ROWE, F. ASCE

EXAMGEM 26 was cited for its "less arithmetic and more plain old-fashioned thinking" than the usual run of examination questions, dealing as it did with the non-academic problem of laying a pressure pipeline across a wide active fault zone. It was practical, too, for the prototype line had been built.

Some started with arithmetic just the same, computing the wall thickness for a 10-in. steel pipe to carry 400 psig, adding extra metal arbitrarily to withstand seismic forces. This was futile, for the best solutions took advantage of flexibility of the pipe.

Many offered elaborate and fanciful solutions and then alibied that they had migrated from non-seismic areas and could not be expected to know about earthquake-resistant techniques. This proved the gem quality of the question, for it is most important that migrants be examined on engineering factors peculiar to the region. The Dakotan in California must learn about quakes; the Californian in Dakota must learn about frost.

These fanciful solutions included such ideas as (1) entrenching the pipe to unusual depth, (2) bedding the pipe on a heavily reinforced concrete cradle, and (3) swinging the pipe in slings suspended from A-frames or gallows frames. A minor movement might shear the first two; the third risked resonant vibration and might even be punished by wind.

There is no perfect solution, for any precaution within reason must accept some hazard, some calculated risk. The young engineer should conceive of segment AB of his line across the fault zone as stretching, shrinking, or offsetting in a dynamic, pulsing, reciprocating motion, with a net or cumulative shift of several feet. With AB a mile long, the pipe is a very flexible structure that could stretch 5 ft and change length even more by buckling and unbuckling. It can't do that very well underground, and an aerial line would be expensive to support and control.

The safest place is right on the ground, and such a location will facilitate future inspection and repair. It might be laid on a well-drained sand bed, wide enough to allow snaking and buckling, or a few inches higher on ground sills or cross ties. With the latter, the pipe might be free to move laterally on the sill, or be clamped to a sill free to move.

He was asked what measures he would recommend for design, construction and maintenance. For design, as implied above, he might choose a curved alignment on flat or undulating grade just above ground level, on sills spaced a pipe length apart so that joints will fall near point of contraflexure. It would extend several pipe lengths outside the fault zone, with a gate upline, a check downline, and no fittings between.

Construction measures should include an overnight hydrostatic test at 150 percent of working pressure, drainage diversion to prevent erosion or deposit around sills, and fencing or signing to exclude cross traffic of people, vehicles, or animals. Maintenance should include periodic observation of creep of pipe, tightness of joints and bedding of sills, ordering repair or adjustment of defects.

Incidentally, the prototype line was laid straight, relying on evidence that horizontal motion had been in the offset direction. Also, in epilogue, the problem has had the salutary effect of adding a session on earthquakes to all refresher courses for prospective registrants in California. They don't know when the problem might be repeated, but, like earthquakes, the longer it has been since the last one, the nearer you are to the next one.

EXAMGEM 27. Many engineering terms consist of word pairs, like *bench mark* and *soldier beam*. Identify the pairs in the following alphabetical list and define or describe each of the eight terms: area, caisson, digestion, energy, frame, girder, jetty, moment, permeable, pneumatic, ratio, rigid, sludge, specific, voids, wide-flange.

Steel tunnel sections built in Maryland . . . floated 200 miles to Virginia

Steel supplied by Bethlehem: plates, structural shapes, bars, H-piles.

Eleven of these 33-ft-diameter tunnel sections, each measuring more than 300 ft long, and one measuring 115 ft long, were constructed at Port Deposit, Md., side-launched into the Susquehanna, and towed to the Elizabeth River in Virginia. Here they were sunk into position to form a two-lane vehicular tunnel connecting Norfolk with Portsmouth.

Each section contains nearly 600 tons of steel: 450 tons of plate for the inner and outer shells; 70 tons of shapes and angles, and 30 tons of flat bars for stiffeners; and 40 tons of concrete reinforcing bars, here being installed. Bethlehem supplied much of this steel.

Owner: Elizabeth River Tunnel District of Norfolk;

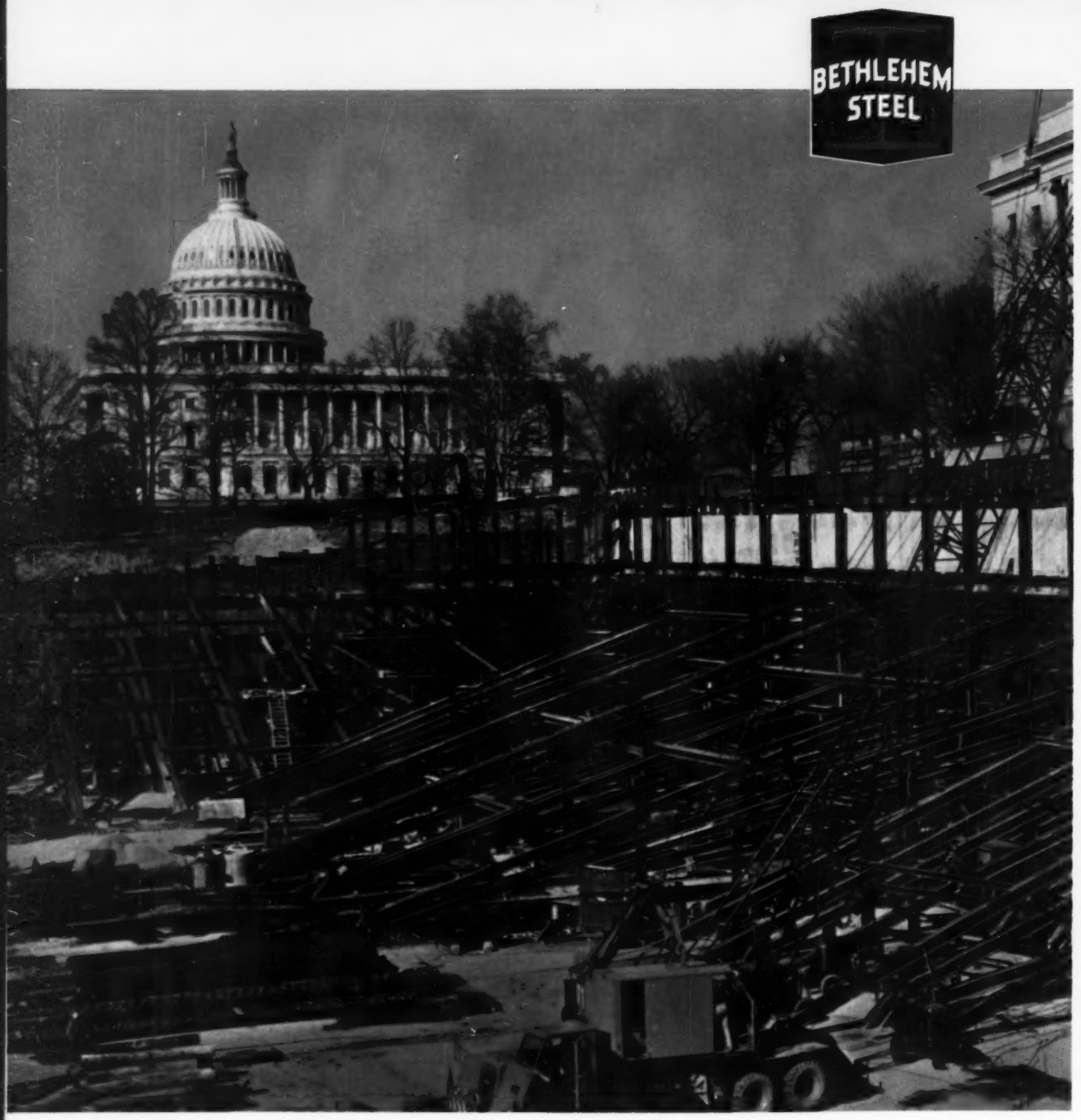
Designer and supervisor of construction: Parsons, Brinckerhoff, Quade and Douglas;

Prime contractor: Diamond Construction Co.;

Fabricator: Wiley Manufacturing Co., subsidiary of Republic Industrial Corp.

BETHLEHEM STEEL

BETHLEHEM STEEL



New offices for the House of Representatives

Builder: McCloskey & Co.;
Steel fabricator and erector: Bethlehem Steel.

Steel supplied by Bethlehem: H-piles, reinforcing bars, fabrication and erection of structural steel.

Excavation for the Additional House Office Building covers five city blocks. It provides for a basement, sub-basement, and three garages below ground level. A huge drainage system will contain the historic Tiber Creek that once ran through the Capitol grounds. Shown here is the Bethlehem steel piling erected as reinforcement for the excavation walls. Over 14,000 tons of Bethlehem steel reinforcing bars were used. Bethlehem also fabricated and erected 23,000 tons of structural steel for the office building which contains 33,600,000 cu ft of space as compared to 7,600,000 in the Capitol building.

Steel

for Strength . . . Economy . . . Versatility

Circular stadium takes shape in Washington

Steel supplied by Bethlehem: fabrication and erection of structural steel, reinforcing bars, pipe, sheets, fasteners, H-piles, Slabform (formed sheet).

A circular, double-decked stadium, new home of both the Senators and Redskins, will seat 45,000 fans during baseball season. Sections of the lower stands are movable, allowing for an increase to 50,000 fans for football. No supporting columns obstruct vision because seats and roof are supported by 66 huge steel cantilever arms, fabricated from Bethlehem steel plate. The frames are laterally connected by a combination of box struts and wide-flange rafters. Bethlehem also supplied over 5,000 tons of concrete reinforcing bars, 5,990 tons of H-piles and 245 tons of steel pipe to the project. A total of 7,350 tons of steelwork was erected by Bethlehem.

Owner: District of Columbia Armory Board;

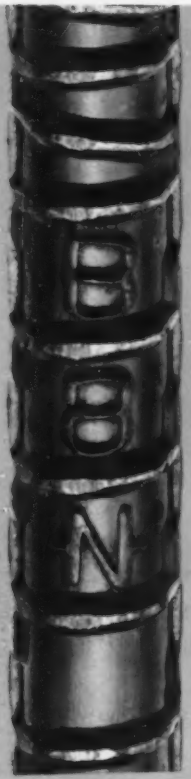
Architect and engineer: Dahl-Ewin-Osborn;

Builder: McCloskey & Co.

BETHLEHEM STEEL

It's easy to identify Bethlehem high-strength reinforcing bars–

in the field or in your shop

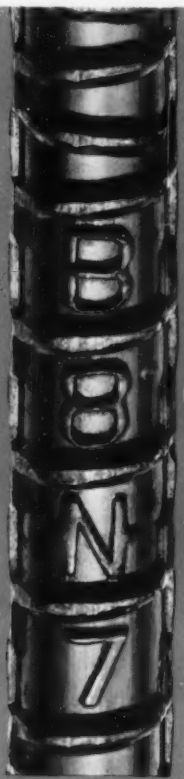


ASTM A-15

Bethlehem bars are always branded in the same sequence:

- B means Bethlehem produced the bar
- This number is the bar size (always between the letters)
- -N- means the bar is made of domestic new-billet steel
- This number designates the grade of high-strength steel (7 for 75,000 psi min. yield and 6 for 60,000 psi min. yield)

ASTM A-432



ASTM A-431

STEEL CONSTRUCTION IN MOTION PICTURES

These Bethlehem motion pictures are available free of charge. All are 16 mm, in color, with sound track. Just fill in the coupon and mail to us at Bethlehem, Pa.

OPEN ROAD (Highway construction). Color, 32 minutes.
SKYLINES (Structural steel). Color, 29 minutes.
STEEL IN CONCRETE (Reinforcing bars). Color, 38 minutes.
FURY OF THE WINDS (Fabricated steel and the Atlantic hurricane). Color, 24 minutes.
MEN, STEEL AND EARTHQUAKES (Fabricated steel). Color, 28 minutes.
STEEL SPANS THE CHESAPEAKE (Bridge building). Color, 37 minutes.

PUBLICATIONS DEPARTMENT
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

I would like to arrange a showing of the following motion pictures:

Title — Date of showing

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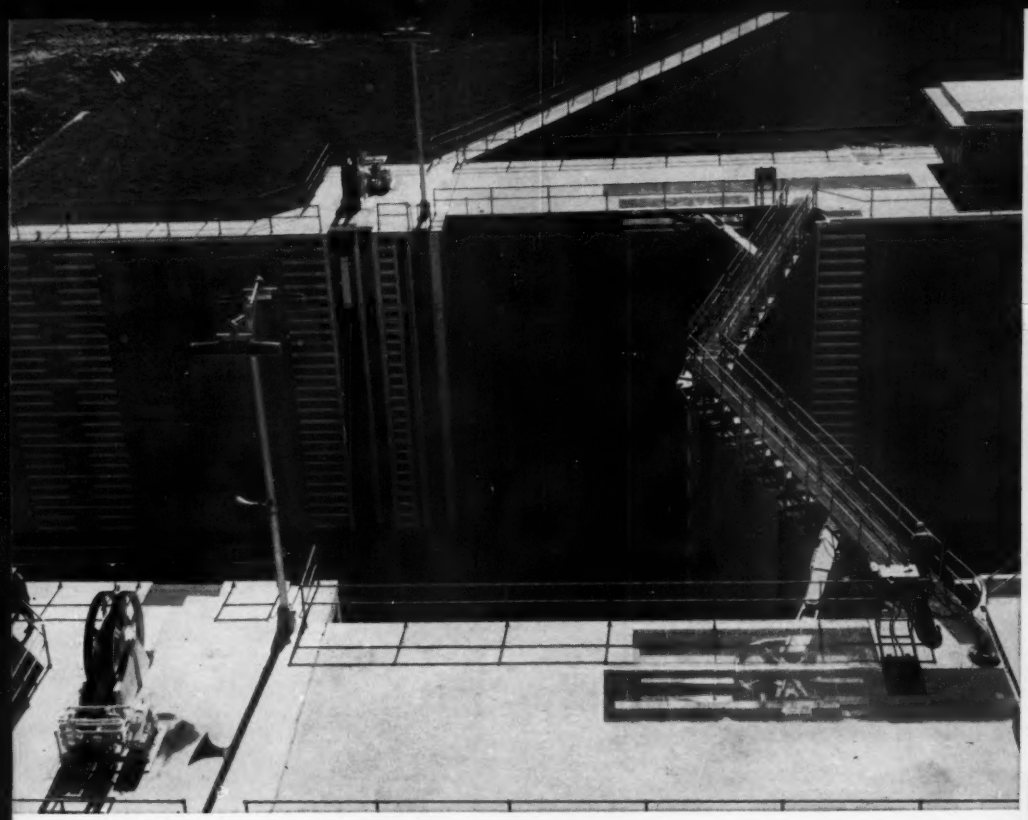
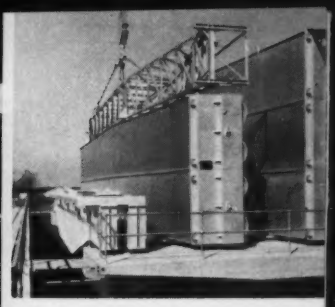
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

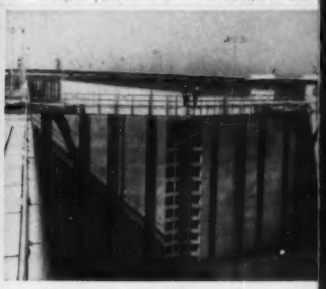
BETHLEHEM STEEL

BETHLEHEM STEEL

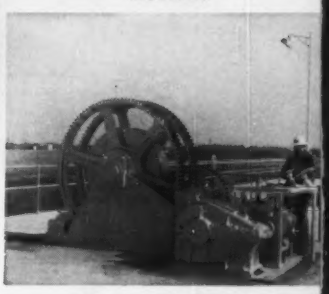




Emergency Bulkhead and Pickup Beam



Lock Gates



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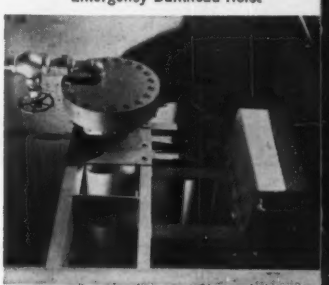
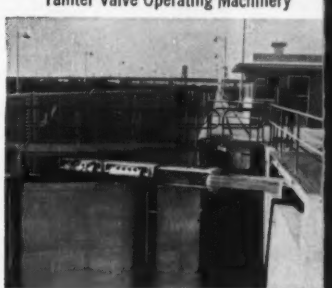
All components were delivered to the building site by barge, after loading out from our wharves, with equipment that includes a 600 ton lifting device.

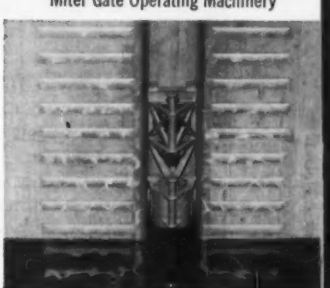
Call Avondale for steel fabrication. We can build it—and deliver it.



Tainter Valve Operating Machinery



Miter Gate Operating Machinery



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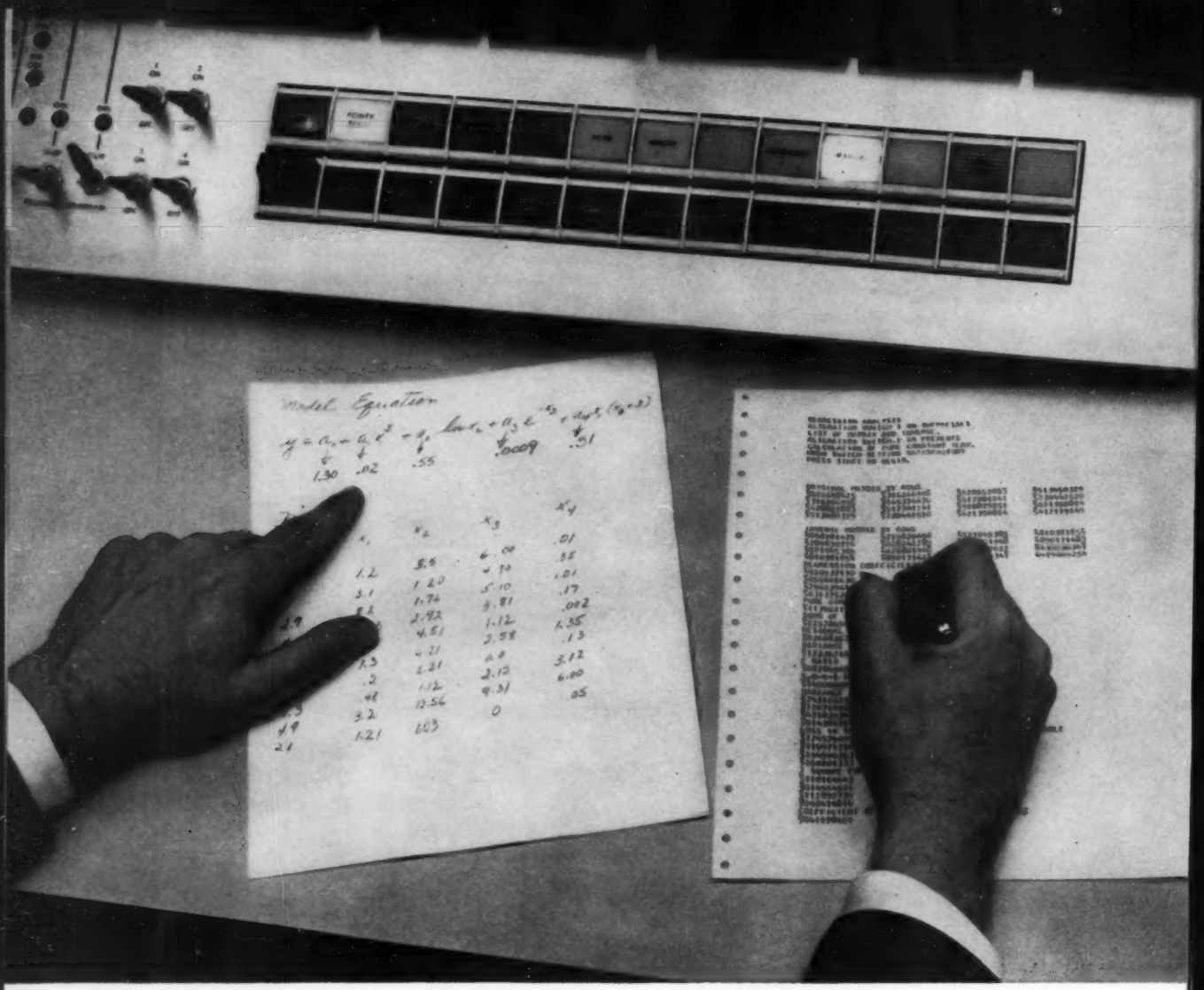

Want to find the coefficients? It's easy with the new Regression Analysis program for the IBM 1620

Here's another program offered free-of-charge to users of the IBM 1620 Data Processing System. It gives you the kind of results you might expect only from a much more expensive computer. But users of the 1620 know that its low rental cost is deceptive. The 1620 packs *more computing power per cubic inch* than any other computer in its size range.

The Regression Analysis program is a good example. Suppose you want a fit for production purposes. If you employ more than two variables you probably have difficulty visualizing the representation of your data. If linearity is not the case, you must often guess blindly at a polynomial of high degree, accept or reject the fit with something approaching a sixth sense, and either try again or settle for the results you have.

The new Regression Analysis program lets you handle expressions containing up to *24 variables*. If you have the even more complicated task of handling many dependent variables, the program will generate regression coefficients with a maximum number of dependent variables not exceeding one-half the number of independent variables.

This program will also fit non-linear functions and hyper-surfaces. Compare this performance with that of any other computer in the 1620's price range.

A basic 1620 installation rents for just $1600 per month. For details, contact your local IBM Representative.

IBM's 1620 is a compact desk-size computer.

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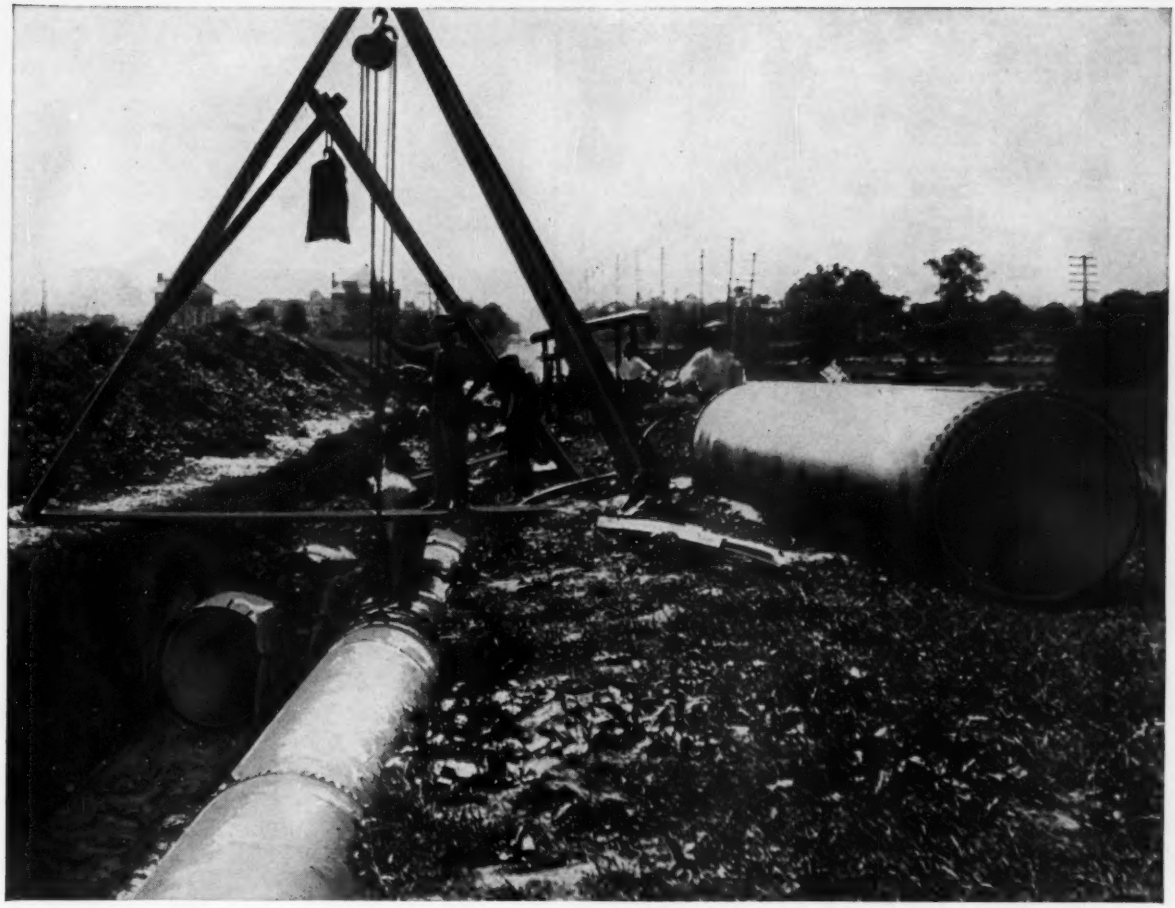

Photographs, factual data, and quotations courtesy of Water Department, Wilmington, Delaware; W. Compton Wills, Manager and Chief Engineer.

Bare steel pipe, installed in 1907-1908, is still serving Wilmington, Delaware

Pardon the murky old photographs. They were taken in 1907, the year Wilmington began installing two major steel pipelines, totalling 20,340 ft. Even though this pipe was put in *bare*, it has given "very satisfactory service" during the past 54 years, and is reported by the Water Department to be "in satisfactory condition for use over the next 15 to 20 years or longer."

Of course, nowadays we don't recommend installing steel pipe without AWWA-approved protective materials. Many years of experience have convinced us that shop-applied coal-tar enamel assures incomparable protection from attack, and sustained carrying capacity. If Wilmington's *bare* pipe can serve for more than a half-century—with no end in sight—what is the reasonable service life of properly protected steel pipe? One hundred years? More?

Long service life, high flow capacity, tight joints, freedom from the failures of brittle materials—those are the advantages of coal-tar-enameled steel pipe. May we give you additional facts? Just get in touch with the Bethlehem sales office nearest you.

Wilmington's old steel mains comprise some 12,000 ft of 48-in. pipe and 8,000 ft of 43-in. pipe, all of lockbar construction with riveted field joints.

Steel *for Strength . . . Economy . . . Versatility*

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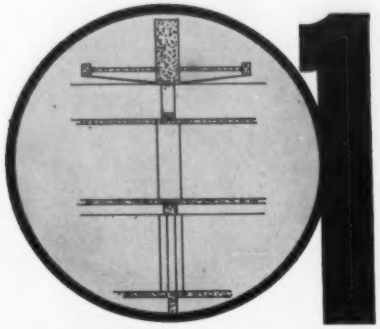
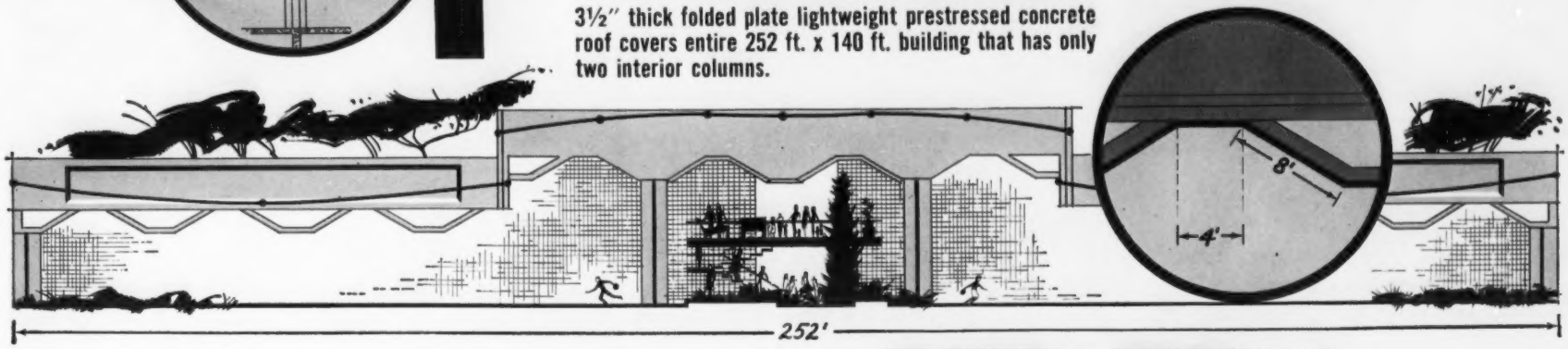


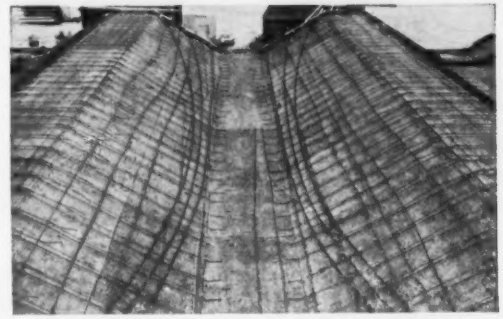
POST-TENSIONED PRESTRESSED CONCRETE BEAM HOLDS ROOF OF 42,500 SQ. FT. BOWLING ALLEY!

3½" thick folded plate lightweight prestressed concrete roof covers entire 252 ft. x 140 ft. building that has only two interior columns.



Three cast-in-place post-tensioned, prestressed concrete beams tied together with Prescon stressing tendons into one long unit make possible the unique structure of a 48 lane bowling alley that has no support columns in the lane area.

The Buccaneer Bowl in Corpus Christi, Texas was constructed at a cost of only $8.40 per square foot using a concrete roof and support beam prestressed by the Prescon System of post-tensioning. This price includes a partial basement, a mezzanine restaurant, observation deck and a luxurious lobby — all air conditioned. The cost of the folded plate and the supporting beams was $1.36 per square foot of area.



Forms built of 4' x 8' plywood sheets ready for pouring of folded plate roof. Stressing tendons provide strength for 70' span.

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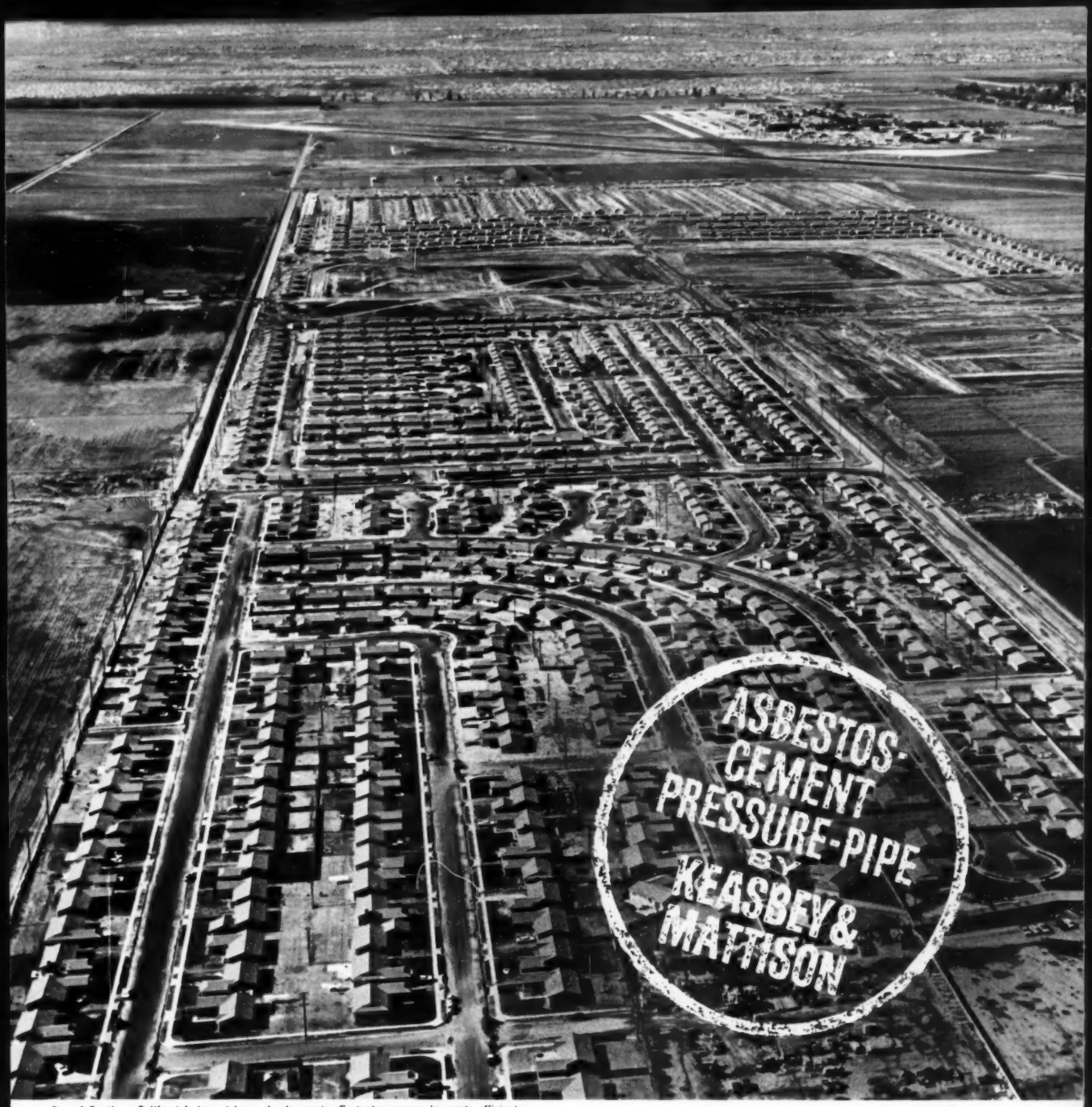
MEMBER PRESTRESSED CONCRETE INSTITUTE



One of Southern California's largest home developments, Eastgate, assures low-cost, efficient water service for its 2250 homeowners with "K&M" Asbestos-Cement Pressure Pipe.

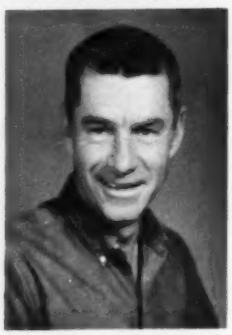
22 MILES OF "K&M" ASBESTOS-CEMENT PRESSURE PIPE ASSURE

dependable water service for a spanking new city of 10,000!

Modern cities like Eastgate spring full-grown from the earth—complete with homes, schools, shopping center and even a hospital. To make such a city a reality calls for modern methods and modern materials, such as "K&M" Asbestos-Cement Pressure Pipe. This rugged pipe was the builder's choice for its freedom from maintenance and for its durability. He knows today's particular home buyers demand materials that function without failure for years and years. Another important factor was the ease of installation and handling "K&M" Asbestos-Cement Pressure Pipe offers. Robert Kennedy, of Kennedy Pipe & Supply Company, tells you, in his own words, how "K&M" Asbestos-Cement Pressure Pipe helped him adhere to a tight schedule.

"THE 'K&M' FLUID-TITE® COUPLING HELPED US LAY MORE PIPE PER HOUR!"

"We had no trouble keeping up with the builder's tight schedule with 'K&M' Asbestos-Cement Pressure Pipe and the 'K&M' FLUID-TITE Coupling. All we had to do was lubricate the pipe end, and slide it into the coupling. This gave us a joint tight under all operating conditions. We didn't need any heavy machinery or coupling pullers. 'K&M' Pipe was lightweight and easy to handle, which permitted us to work smoothly. It reduced our installation time and costs considerably."



Robert Kennedy, President, Kennedy Pipe & Supply Company, Paramount, Calif.

After it's in the ground, "K&M" Asbestos-Cement Pressure Pipe is practically indestructible. It won't tuberculate. This assures the taxpayer of the same water flow and pressure years later, that he had when his home was new. Pumping costs remain low. Joints stay watertight. In addition, this pipe resists corrosion, and is immune to electrolysis.

For more information write to: Keasbey & Mattison Co., Ambler, Pa.

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Keasbey & Mattison at Ambler

The light weight of "K&M"® Asbestos-Cement Pressure Pipe permits you to lay most sizes by hand... and reduces shipping costs.

Assembling the exclusive, patented "K&M" FLUID-TITE® Coupling and Pipe takes but an instant.

ACCURATE GRAPHIC AND VISUAL REGISTRATION

of liquid flow with

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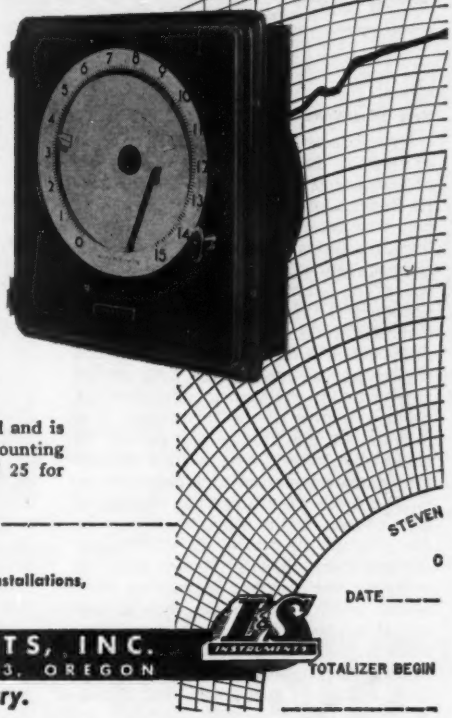
RECORDER TYPE B-FT



Recording, indicating and totalizing meter for measuring sewage or other flows over Parshall flumes and weirs. This instrument has interchangeable flow cams and flow conversion gears... an important factor to consider for sewage treatment plants in rapidly growing communities. With a simple change of cams and gears the Type B-FT Recorder can operate with a different size flume or accommodate a greater range of flow than that for which it was originally purchased. The change does not require factory service. Similarly, change from weekly to daily time scale, or vice versa, is accomplished by merely repositioning one gear — no new parts to buy.

This recorder can be direct float operated or remotely controlled and is available for wall or switchboard mounting, or with cabinet for mounting out of doors directly over the float well. Request BULLETIN 25 for complete details.

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New in education

New educational concepts .....

New educational concepts are being spurred by the *University of California of Los Angeles* according to Dean L. M. K. Boelter, of the College of Engineering, who recently announced the initiation of a series of pre-doctoral and post-doctoral fellowships for the next several years. The fellowships are part of the Educational Development Program, an organized faculty effort, supported by the Ford Foundation and directed toward further improvement of UCLA's unified approach to engineering education. A prime objective of the fellowships is to provide an opportunity for persons to study while contributing to EDP through supplementary parttime employment on EDP projects or through the teaching of core courses in the school's undergraduate program. At present the EDP is conducting more than 20 studies aimed at unifying one or more engineering disciplines, under classifications such as analytical methods, design, energy and mass transfer, and engineering materials, rather than the traditional classifications of civil, electrical, mechanical, etc. Participating in the development program are 50 plus faculty members, a dozen lecturers and associates from industry, and 15 graduate students and fellows. Inquiries may be directed to William D. McIlvaine, Secretary, Educational Development Program, College of Engineering, University of California, Los Angeles 24, Calif.

Florida, engineering and industry .....

In the forefront of the industry build-up currently underway in Florida is the Engineering and Industrial Experiment Station (EIES) of the *University of Florida's College of Engineering.* The Station is literally the research laboratory for Florida's industries. In the Pulp and Paper Laboratory a pilot plant has been constructed which uses a revolutionary continuous process which promises to reduce the cost of producing pulp. Similarly, the Civil Engineering Research Laboratory's outstanding results in methods of casting and testing prestressed post-tensioned concrete beams have been a great service to the Florida building industry. To protect the Florida coastline, which is so valuable to the economy of the state the University's Coastal Engineering Laboratory has undertaken a program of applied research involving model studies of erosion and navigation problems at Boca Raton, Sarasota Bay and Fort Pierce Beach to name a few. Also of great interest to engineers is the research the Air Pollution Laboratory is conducting, such as developing automatic sampling equipment for a variety of pollutants, creating simplified techniques for air pollution measurement, and studying the effects of various contaminants on human health, vegetation, and materials. As well as the research it is conducting in conjunction with the Earle B. Phelps Laboratory for Sanitary Engineering on a continuous radioactive monitoring program of fall-out in air, sewage, surface waters, public water supplies, plants and soils.

Traffic, present and future .....

The nation's traffic problem continues to grow in size and complexity each year. To help interested officials stay abreast of progress in this area *Northwestern University's Traffic Institute* under its Unit Course Program is offering, from September 1961 to November 1962, short-term professional-level instruction for selected personnel from federal, state and municipal government agencies. Two specialized courses in traffic engineering, consisting of a seminar and advanced workshop is scheduled, respectively, for March 5-23, 1962, at a fee of $225, and for November 13-17, 1961, at $100. Although no academic credit is given for these courses, each registrant successfully completing a Traffic Institute course will be awarded a certificate. For catalog and application blanks write to Bernard R. Caldwell, Director, The Traffic Institute, Northwestern University, 1804 Hinman Avenue, Evanston, Ill.

A Highway Traffic Safety Center was established sometime in August at the *University of Illinois College of Engineering* to coordinate on a university-wide basis present and future programs in this field. Named as director is Professor John Baerwald, A.M. ASCE, staff member since 1955 and nationally recognized traffic engineer. Activities of the center will include formal and extension education, research and information services, and toward this end it will coordinate the university's activities in safety teaching and research, provide a channel through which financial support—including that from agencies outside the university—can be made available for such efforts, and facilitate use of resulting traffic safety information.

Highways .....

As an aid to America's need for new and better highways, *Purdue University* conducted an eight-week advanced study program this summer of courses in geometric design, highway planning and economics, highway and airport pavement design, cement, aggregates and concrete, and in the basic physical and chemical properties of materials. Nineteen instructors and professors of highway engineering from throughout the United States and Canada attended, each man receiving a free-grant fellowship sponsored by the Portland Cement Association.

Research in reinforced concrete .....

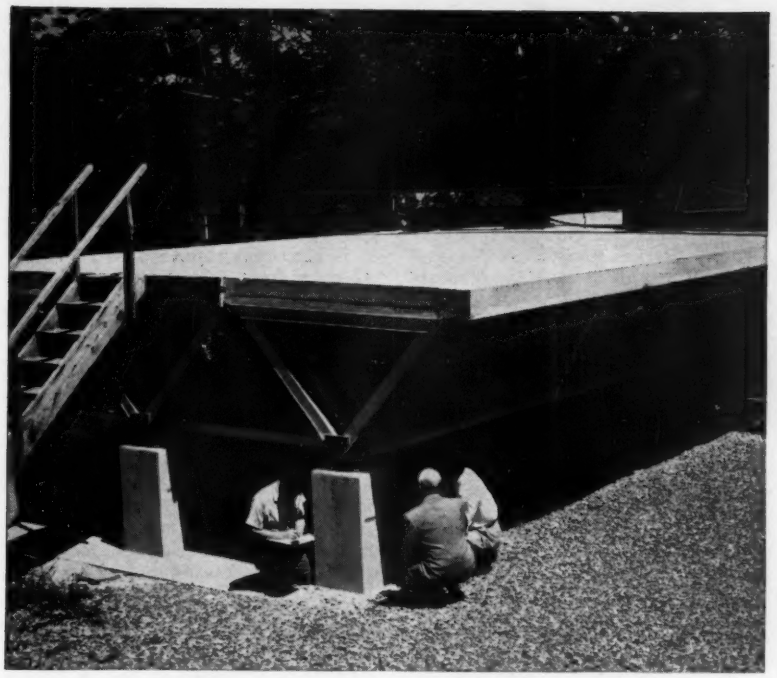
Recognizing the need for increased financial support for research in the reinforced concrete field, the American Concrete Institute has made a $2,000 grant to the Reinforced Concrete Research Council. As coordinating agency for reinforced concrete research projects being conducted at U.S. universities, the Council hopes to initiate at least six new projects each year, a program that would require a minimum annual budget of $100,000. Council-sponsored research is in the form of financial aid to graduate students which allows them to undertake and complete work for advanced degrees.

Construction methods .....

This fall the civil engineering department of the *University of North Dakota* will offer a course in construction methods for undergraduate students. Professor Robert C. Sheldon, F. ASCE, of the University's Civil Engineering Department is writing a textbook preparatory to teaching the course. Instead of adopting the usual approach of talking about construction by types, he will break the construction process down into its six fundamental operations: breaking loose, lifting, transporting, separating and mixing, placing and fastening. Also included in the course will be a discussion of the engineer's place in the construction firm.

NSF fellowships .....

Applications are now being accepted in two *National Science Foundation* graduate-level fellowship programs: Cooperative Graduate Fellowships for the academic year 1962-1963, and Summer Fellowships for Graduate Teaching Assistants, for the summer of 1962. For which applications must be received November 1 and December 8, respectively. Now entering their fourth year of operation, the two fellowship programs are administered cooperatively by the National Science Foundation and institutions of higher education in the United States which confer doctoral-level degrees in engineering, mathematics and the sciences. A Cooperative Graduate Fellow will receive a stipend of $2,400 for a full year's tenure or $1,800 for the academic year, which may be augmented by his institution. While a Summer Fellow in the Graduate Teaching Assistant program will receive a stipend ranging between $50.00 and $75.00 per week. Application materials can be obtained from the Graduate Dean of any participating institution or from the Fellowships Section, Division of Scientific Personnel and Education, National Science Foundation, Washington 25, D. C.



Civil Engineers research performance of new stressed-skin aluminum bridge structure. Data will provide other CEs with design and specification criteria... first step to sales in construction market.

Controls 30 billion in annual expenditures

Annual construction from 1957 to 1960 averaged 52 billion dollars*. Of this, *engineered* construction, that controlled by the Civil Engineer, amounted to 29.98 billion. This figure *excludes* housing projects, motels and other large residential construction work, which is also normally Civil Engineer controlled. Furthermore the figure does not reflect the extensive influence of the Civil Engineer over residential building codes and practices.

**Summary total from published U.S. Bureau of Census figures*

The CIVIL ENGINEER is DECISIVE

in the purchase of the materials, services, installed equipment, and construction machines used in engineered construction

From conception to dedication **of every engineered construction job, the decision of the Civil Engineer is all pervading and *final*.**

This is not simply a matter of general trade practice. Nor is it merely a convenience. It's a *legal* reality... that holds in varying degree in every state of the Union and in most other countries... that applies not only in public works but in private construction as well.

Often overlooked

The *legal* responsibility of the Civil Engineer for *purchase decisions* is frequently overlooked. One reason for this is the time-honored phrase "or equal" which seems to leave brand decisions up to the contractor. Practically, this is rarely so. Instead the phrase has been used to restrict to one or a very few the number of suppliers capable of meeting the specification. As a matter of fact, the phrase "or equal" has been proved *too* broad... and most of today's specifications read, "or *approved* equal."

Approved? By whom? What criteria?

To suppliers of materials, services, installed equipment, and construction machines used in engineered construction those are pertinent questions. And the answers are not left to chance. In all governmental agencies from Town Councils to Federal Governments standards for both public and private construction are established by legislative action or administrative edict. These standards range all the way from engineering design details to the type of equipment to perform the work.

Legislative action and administrative edict alike are recommended, promulgated, administered... and compliance therewith on specific jobs is supervised ... by the Civil Engineer.

In consulting and contracting firms and a large number of architectural firms a Civil Engineer is the responsible decision-maker who sees to it the item meets required standards and who devises new designs and construction methods ... often based on new materials and equipment. Upon his decisions commercial success of the firms stands or falls.

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DECEASED

Gary Dale Adams (J.M. '59; A.M. '59), age 27, a civil engineering graduate in 1956 of the University of Tennessee, for the past four years was a member of the U.S. Public Health Service in Dallas, Texas. During this period he engaged in general sanitary engineering work related to stream pollution, first as a junior assistant sanitary engineer, and more recently as assistant sanitary engineer.

Stuart H. Anderson (M. '45; F. '59), age 75, founder of Stuart H. Anderson & Associates, in the last ten years maintained offices in Washington, D.C.; Camden, N.J.; Uniontown, Pa.; and Baltimore, Md. Before that he was examining engineer with the Bureau of Community Facilities of the Federal Works Administration; engineer-in-charge of the design of water, sewers and drainage at Andrews Field in Maryland for Gannett, Fleming, Corddry & Carpenter; associate engineer with the industrial engineer, W.S. Austin; and a designer with the Consolidated Gas and Electric Company of Baltimore.

Daniel E. Davis (M. '25; F. '59), age 75, in 1919 joined Chester Engineers as a partner where he subsequently specialized in waterworks, sewers and sewage treatment plants, filtration and softening plants, power plants, and reservoirs. When the National Resources Committee of the Water Resources of the United States made a study of the Ohio River Basin, Mr. Davis served with the study group as associate water consultant. In addition his interest in community affairs led him to serve as a councilman for the Pennsylvania borough of Osborne for some 25 years.

John N. Eckle (A.M. '41; M. '59), age 73, before becoming a consultant with Branford Associates at Branford, Conn., in 1958, was a member of the Yale University Department of Civil Engineering for 38 years, serving from 1927 until his retirement as assistant professor of engineering drawing. For much of this period —during summers—he had charge of the concrete testing laboratory of the E. W. Wiggin Company and one year, 1929, was engineer in charge of constructing the skew bridge over the Black River in Vermont.

Joseph Francis Foley (M. '41; F. '59), age 72, having joined the Callan Construction Company, Inc., in Bristol, R.I., in 1925, served it successively as acting chief engineer, as vice president and general manager, and most recently, as president and treasurer. In addition, he was acting chief engineer of the Rhode Island companies of Montaup Sand & Gravel and Ready Mixed Concrete, as well as being chief engineer and treasurer of the Joseph T. Foley Engineering Company of Somerset, Mass.

A. B. Ilsley (M.'23; F.'59), age 88, from 1930 to 1935 was supervisor of construction in the Office of the Architect in Washington, D.C. Thereafter, until he retired in 1946, he was an engineer with the Bureau of Yards and Docks, and was instrumental in designing the floating docks used during World War II.

Richard S. M. Lee (M. '57; F. '59), age 61, a bridge engineer associated with Parsons, Brinckerhoff, Quade & Douglas for the past 16 years, was responsible for the design of many well known bridges in the New York area; among them the Marine Parkway lift bridge, Captree State Parkway bridge, the New York Central Railroad's Harlem River lift bridge, and the recent improvements to the Manhattan and Queens approaches to the Queensboro Bridge. Other outstanding bridges with which he was concerned are the John E. Mathews Bridge in Florida, the Pelican Island Causeway in Texas, and his latest activity the 62nd Street Bridge, now under construction in Pittsburgh, Pa.

Ralph K. Linville (A.M. '24; M. '59), age 73, in recent years had maintained a consulting engineering office in Washington, D.C. At various times in his career he was in private practice in Baltimore, Md.; principal engineer in the Office of the Chief of Engineers in Washington, D.C.; president of the Standard Construction Company in Baltimore; city engineer of Danville, Va.; and assistant engineer in the Baltimore Water Department.

Fred F. Loy (M. '58; F. '59), age 55, district engineer of the Portland Cement Association's Iowa District since 1948, had been with the Association since joining its Des Moines office as general field engineer in 1937. Prior to the latter year, Mr. Loy was employed by the North Dakota State Highway Department and by the North Dakota counties of Dunn and Stark as county engineer.

Paul Wilmer Mack (A.M. '26; M. '59), age 74, for the past 13 years was president of the Farmers Bank and Trust Company in Indiana, Pa. Mr. Mack had previously worked in the building contracting field as a partner in Blair and Mack from 1923 to 1934 and as vice president of the Mack Realty Company from 1934 to 1946. This latter company, through its subsidiary, the G. L. Murphy Company, owned properties in many states.

Verne O. McClurg (M. '41; F. '59), age 71, prominent Chicago engineer, was a partner in the architectural and engineering firm of McClurg, Shoemaker and McClurg. Among Chicago landmarks on which he directed preparation of structural plans are the Board of Trade Building, Sherman Hotel, Palmolive Building, University of Chicago field house, and Riverside Plaza, the former Daily News building.

Frederick V. McGuire, Jr. (J.M. '50; A.M. '59), age 31, having graduated from Rhode Island State College in 1950 with a B.S. in civil engineering, subsequently served with the U.S. Army for several years. Then, a few years ago he joined the Boston firm of Stone and Webster where he was employed until his recent death.

Guttorm Miller (M. '18; F. '59), age 81, was formerly chief engineer of the A. J. Dupuis Company in Detroit, Mich. In this capacity he worked on the Detroit-Windsor Tunnel and the Holland Tunnel in New York.

Edward Newton Noyes (M. '17; F. '59), age 80, a Corpus Christi, Texas, civil engineer, is credited with being the driving force behind the city's bayfront improvement project in the 1940's. Early in his career he joined former classmate E. L. Myers in a partnership which lasted 42 years, from 1911 to 1953, and, subsequent to 1953, was a consultant for Reagan and McCaughan, which was made up of former members of the Myers and Noyes firm.

Harold E. Orford (A.M. '54; M. '59), age 47, professor of sanitation at Rutgers University, first joined the engineering staff there in 1938. Dr. Orford was chairman of the Department of Sanitation at Rutgers' College of Agriculture and Agricultural Experiment Station from 1954 until 1957 when for reasons of health he resigned the chairmanship. He continued, however, to serve as professor.

Raymond C. Pierce (A.M. '20; M. '59), age 74, for the past 12 years a member of Triopane Gas, Inc., in Nashville, Tenn., was president of the gas company at the time of his recent death. Earlier he had been a hydraulic engineer and dredging contractor working at dams, lakes and levies throughout the United States. In this connection, Mr. Pierce had worked with the University of the South in Sewanee, seeking a solution to its water supply problem by establishing several lakes of varied sizes on the campus.

E. Pratt (M. '47; F. '59), age 74, from 1954 to 1957 was a representative to the United Nations Economic and Social Council for the Engineering Joint Council in New York, having previously served in 1953 as consultant to Chile and later, in 1957, as aide to Lebanon on standardization matters. A specialist in roads, bridges and airports, he worked for Pan American on airport construction in South America during the 1940's.

Alan D. Roberts (M. '60), age 42, since 1957 in private practice in Los Angeles and San Diego, Calif., several years earlier had maintained a consulting practice in New York and Florida. In the intervening years he served as engineer on a large U.S. defense project with the Carter-Schneider Construction Company in Las Vegas, Nev., and as project manager for the Zimmer-Lieberman Construction Company in Los Angeles. Other experience included the post of engineer and project manager with the River Heights Construction Corporation, supervising several large FHA housing projects in the New York area.

E. S. Sastri (M. '61), age 42, during his career engaged in various construction projects for the states of Madras and Andhra in India. In recent years he had sole charge of the work of constructing the Aqueduct across the Hagari River for the Tungabnra Right Canal in Madras, and was executive engineer in charge of

(Continued on page 136)

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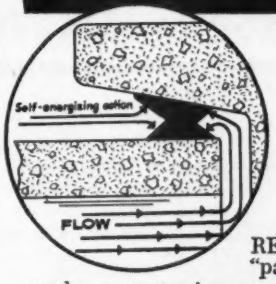

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the Tungabhadra project distributary system in Andhra. Then, last year he began special training under the International Cooperation Administration Program with the U.S. Bureau of Reclamation at Denver, Colo., in the Design and Construction of High Dams.

Mathias W. Sample (M. '34; F. '59), age 74, prior to retiring around 1950, was for many years a member of the Chile Exploration Company staff which he served in various capacities. Starting at the bottom he worked up to chief mining engineer, mine superintendent, assistant general manager and then, in 1945, manager.

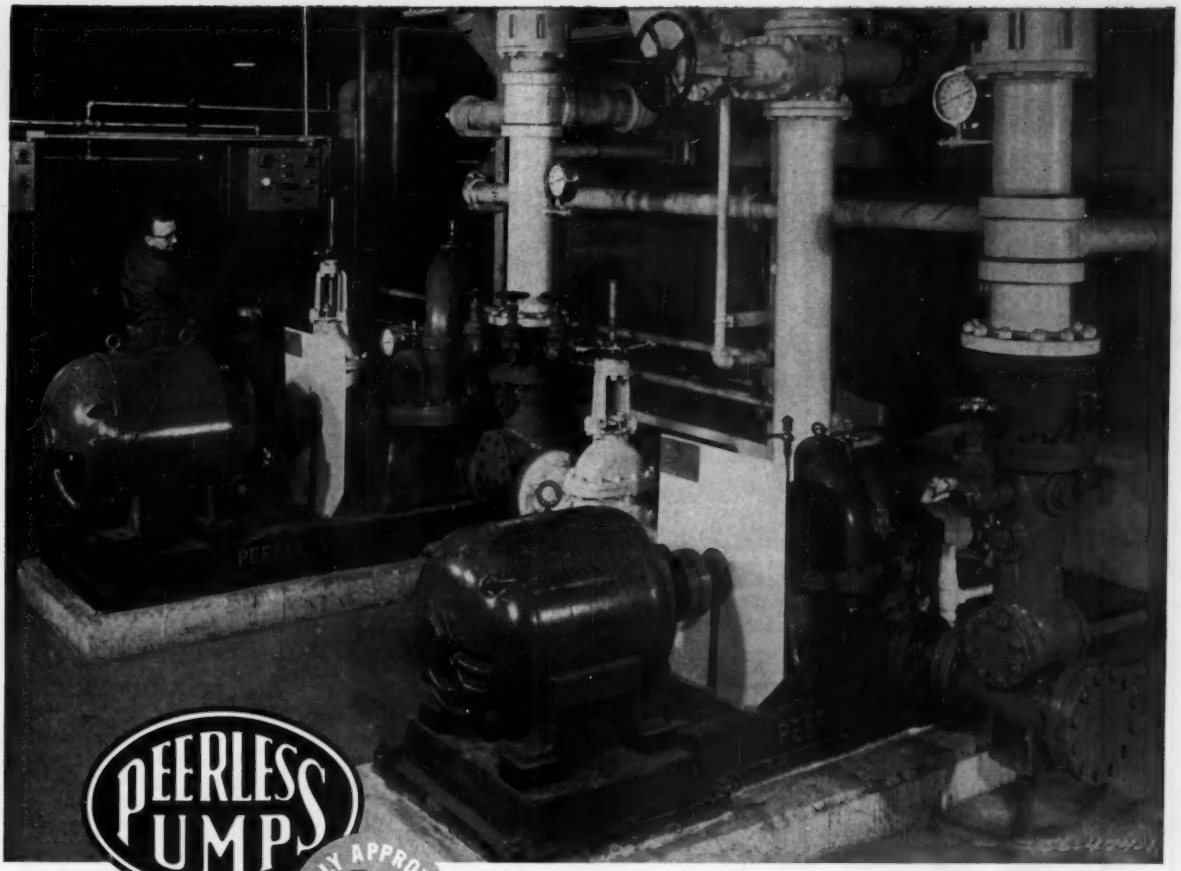
Leon Herbert Sault (M. '31; F. '59), age 78, until his retirement nine years ago was a prominent civil engineer in St. Paul, Minn., where he was manager and owner of the Sault Construction Company. Prior to going to St. Paul, Mr. Sault's early engineering experience was gained in New York and surrounding states.

Guy Burdette Skinner (M. '29; F. '59), age 79, a retired captain in the U.S. Coast Guard, having received his bachelor degree from Syracuse University in 1907, that same year joined the office of the superintendent of Lighthouses at Staten Island, N.Y., as a draftsman. From there he went to the Bureau of Lighthouses in Washington, D.C., where he was chief of the Architectural and Structural Division. For several years prior his retirement in 1945, Captain Skinner served the Coast Guard in the Chicago and Cleveland Districts.

H. C. Tammen (M. '19; F. '59), age 76, a specialist in bridge design, since his retirement in 1949 had been an inactive partner and special consultant in the firm of Howard, Needles, Tammen & Bergendoff, of New York and Kansas City. Among the bridge designs he worked on were the Harlem River lift span of the Triborough Bridge in New York, the Delaware Memorial Bridge at Wilmington, the Passaic (N.J.) River lift span, the Old Lyme-Old Saybrook Bridge over the Connecticut River and the Edison Bridge over the Raritan River in New Jersey.

Eduardo Torroja (M. '43; F. '59), age 61, at the time of death was director of the Instituto Tecnico de la Construccion in Madrid, Spain, having previously served there as professor of reinforced concrete and structural typology. Mr. Torroja was a structural consulting engineer in Madrid and a leader in the design of concrete structures. He was one of the oustanding engineers of Spain and is known in this country for his thin-shell structures.

Lewis Van Niekerk Vink (A.M. '60), age 33, for the past three years had been senior assistant engineer with the South African Municipality of Paarl. A decade earlier he had joined the Simpson Road Construction Company in Parow, South Africa, as a junior engineer, and by 1957 was manager in charge of the company.



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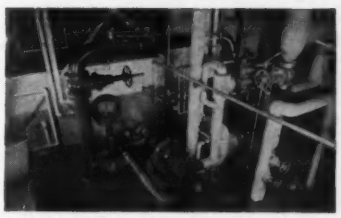

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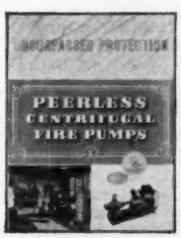

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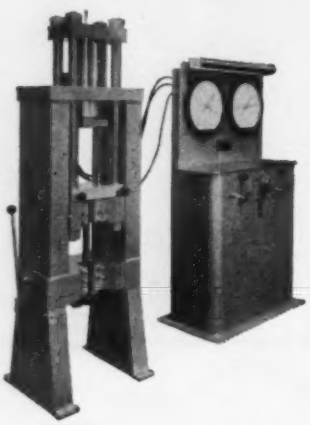

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Non-ASCE MEETINGS

American Association of State Highway Officials. General meeting at the Statler-Hilton Hotel, Denver, Colo., October 9-13. Sessions on electronics as applied to road building will be a feature.

American Concrete Institute. Fourteenth Regional Meeting at the Dinkler-Tutwiler Hotel. Birmingham, Ala., November 1-3, 1961.

American Congress on Surveying and Mapping. Arizona Southwest Regional Meeting at the Hotel Westward Ho, Phoenix, October 18-21, 1961.

American Institute of Electrical Engineers—American Society of Mechanical Engineers. National Power Conference at the St. Francis Hotel, San Francisco, Calif., September 24-27, 1961.

American Public Health Association. Eighty-ninth annual meeting at Cobo Hall, Detroit, Mich., November 13-17, 1961.

American Public Works Association. Annual Public Works Congress and Equipment Show at the Municipal Auditorium, Minneapolis, Minn., September 24-27, 1961.

American Society of Mechanical Engineers. Annual meeting at the Statler Hilton Hotel, New York, N.Y., November 26-December 1, 1961.

American Society for Metals. Forty-third National Metal Congress and Exposition at Cobo Hall, Detroit, Mich., October 23-27, 1961.

American Society of Photogrammetry. Semi-annual Convention and Technical Exhibit at the Biltmore Hotel, New York, N. Y., October 4-6, 1961.

American Society of Safety Engineers. Annual meeting in the Waldorf Room of the Conrad Hilton Hotel, Chicago, Ill., October 16, 1961.

American Standards Association. Twelfth National Conference on Standards at the Rice Hotel, Houston, Texas, October 10-12, 1961.

American Welding Society. Fall meeting at the Adolphus Hotel, Dallas, Texas, September 25-28, 1961.

Engineers' Council for Professional Development. Twenty-ninth annual meeting at the Sheraton Seelbach Hotel, Louisville, Ky., October 2 and 3, 1961.

Industrial Building Exposition and Congress. Second annual meeting produced by Clapp & Poliak, Inc., exposition management firm, at the Coliseum, New York, N. Y., September 25-28, 1961.

National Safety Council. Annual meeting at the Conrad Hilton Hotel, Chicago, Ill., October 16-21, 1961.

National Society of Professional Engineers. Fall meeting at the Hotel Roanoke, Roanoke, Va., October 19-21, 1961.

New England Water Works Association. Meeting in Poland Springs, Me., September 17-21, 1961.

Prestressed Concrete Institute. National convention will be held in cooperation with the University of Colorado in Denver, Colo., October 15-19, 1961.

Water Pollution Control Federation. Thirty fourth annual meeting in Milwaukee, Wis., October 8-12, 1961. Headquarters will be the Hotel Schroeder.

Western Building Industries Exposition. First annual exposition at the Great Western Exhibit Center, Los Angeles, Calif., October 7-10, 1961.

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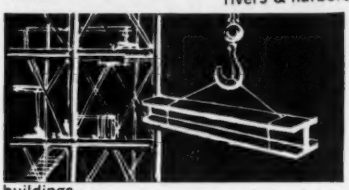
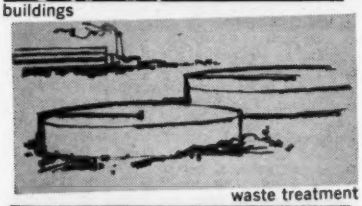
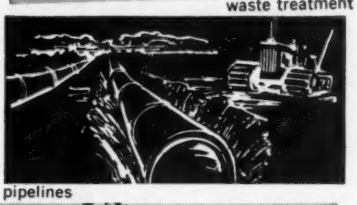


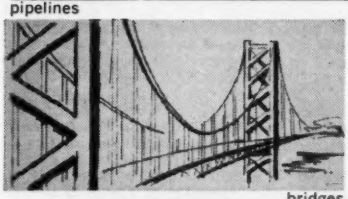
buildings



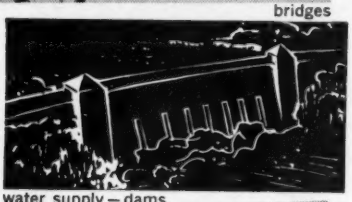
waste treatment



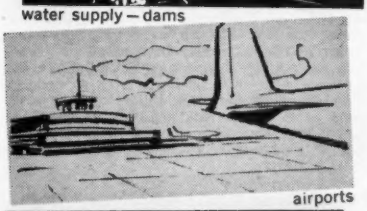
pipelines



bridges



water supply – dams



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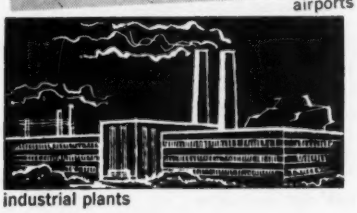

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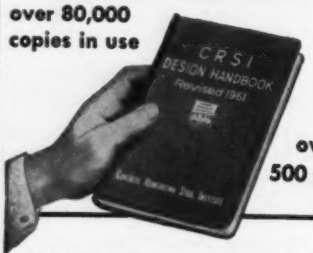

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New Publications

Sanitary engineering . . . . Proceedings of the Sanitary Engineering Conference, held at the University of Pittsburgh's Graduate School of Public Health in October and November 1959, have now been released by the university. The conference was concerned with a wide range of sanitary engineering problems, with special reference to western Pennsylvania. Sponsors, in addition to the host school, were the Pittsburgh Section of ASCE, the Associated Waste Engineers of Pittsburgh, and Carnegie Institute of Technology. Inquiries should be sent to the Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pa.

Highway research . . . . Recent publications of the Highway Research Board include Bulletin 269, entitled "Flexible Pavement Design Studies: 1960," by Professors Karl S. Pister and Carl L. Monismith, Members ASCE; and Bulletin 270, "Asphalt Characteristics and Asphaltic Concrete Construction," by J. H. Kietzman. They may be obtained from the Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C., at $1.60 and $1.40. Also available is a free listing of "Publications of the Highway Research Board," as of January 1961.

Radioactive waste . . . . The ultimate disposal of radioactive waste—a matter of increasing concern as the nation moves toward a nuclear-power economy—demands continuing study to keep such by-products from endangering future generations. This forecast, with some proposed solutions to the problem, appears in an AEC-sponsored nuclear energy waste-disposal study released to science and industry through the Office of Technical Services. The 169-page reference, entitled "Radioactive Waste Disposal," may be ordered from the Office of Technical Services (Business and Defense Services Administration, Washington 25, D.C.) at $2.75 a copy.

Freeways . . . . Twelve seminars on freeway functioning in all parts of the country—conducted by the Institute of Traffic engineers in 1958 and 1959—are now reported in an 88-page brochure entitled "Freeway Operations." The publication contains many recommendations growing out of discussions at the seminars. On controversial points, both sides of the argument have been presented. Copies are $1.00 (reduced prices for purchases in quantity), and orders should be sent to the Institute of Traffic Engineers, 2029 K Street, N.W., Washington 6, D.C.

Pollution laws . . . . Availability of the 1960 edition of the Digest of State Air Pollution Laws—prepared by the U.S. Department of Health, Education, and Welfare from an examination of pertinent state statutes—is announced. It is expected that the digest will be helpful to all concerned with making pollution-control policies or with evaluating existing policies. The revised edition, identified as PHS Publication No. 711, is for sale by the U.S. Government Printing Office, Washington 25, D.C., at 75 cents.

Professionalism . . . . Twelve outstanding papers on the challenging subject, "Professional Climate in Engineering," have just been issued by the University of Cincinnati. The 104-page report represents the proceedings of the College-Industry Conference held in Cincinnati earlier this year. The conference was sponsored by the Relations Industry Division of the American Society for Engineering Education. In attendance were over 300 engineering supervisors representing 104 industries and 33 colleges in all parts of the country. Copies of the complete proceedings may be purchased from the College of Engineering, University of Chicago, at $5.00 a copy.

Photogrammetry . . . . Issuance of "Photogrammetric Rectification," a new volume of the Topographic Instructions of the U.S. Geological Survey is announced by the Survey. The theory and practice of photogrammetric rectification, as applied to topographic mapping, are described in the 42-page volume—fourth in a new series of Geological Survey publications. Copies may be purchased from the U.S. Government Printing Office, Washington 25, D.C., at 40 cents apiece.

Field cost accounting . . . . Publication of a

"Suggested Guide for Field Cost Accounting for Building Contractors" is announced by the Associated General Contractors of America. Long concerned with the relatively high rate of business failures in the construction industry, the AGC developed the booklet after careful study of some eighty forms used by leading AGC building contracting companies. After comparison and correlation, a composite set of forms was developed by a special AGC committee as a guide to improving or initiating a cost-accounting system. Copies, priced at $2.00 each, are available from the AGC National Headquarters, 1957 E Street, N.W., Washington 6, D.C.

Clay pipe . . . . An engineering manual on the use and installation of clay pipe and clay products has been released by the Southern Clay Pipe Institute as a comprehensive reference to aid those engaged in the design and construction of sewerage systems, drains, and other allied types of construction. Engineering practices set forth have been proved on actual projects. The Institute serves as a research center for programs promoting the improved use of clay products. Identified as "Vitrified Clay Pipe Engineers' Handbook," the reference may be purchased for $7.50, from the Southern Clay Pipe Institute, 1401 Peachtree Street, Atlanta 8, Ga.

Metals . . . . The eighth edition of the ASM Handbook contains more than two and a half times as many pages on the selection and properties of metals as appeared in the 1948 edition. In addition to practical articles on the selection of steel for economy in manufacturing and machining, the new edition includes major sections on carbon and low-alloy steels, cast irons, stainless steels and heat-resisting alloys, tool materials, non ferrous metals, and magnetic, electrical, and other special-purpose materials. The 1,300 page reference sells for $30, and is available from the American Society for Metals, Metals Park, Novelty, Ohio.

Positions Announced

U. S. Navy. There are several job openings at the U. S. Naval Civil Engineering Laboratory at Port Hueneme, Calif. On the GS-11 level, salary $7,560 per annum, a General Engineer is being sought to serve as Project Engineer. In connection with his duties, the Project Engineer in addition to attending conferences with manufacturers' engineers and representatives and Laboratory personnel will have technical supervision over varying numbers of civil engineers and technicians. Hydraulic Engineer positions on the GS-11 or GS-12 (at $8,955 per annum) level and GS-12 or GS-13 (at $10,635) level are available. The first listing involves work on research assignments related to hydraulic engineering, especially as applied to coastal engineering; while the latter listing calls for an Assistant Division Director to establish program or project schedules as well as other management duties. Applicants for these jobs should possess an engineering degree from an accredited university, and depending upon the position, from three to four years of professional engineering experience, one year of which must have been specialized in the fields noted above. However, the Project Engineer's post requires three years' experience in at least two fields of engineering. Standard Form 57 to Code 12C11 will be received by the Placement Section, Industrial Relations Office, Construction Battalion Center, Port Hueneme, Calif., until the vacancies are filled.

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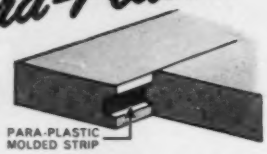
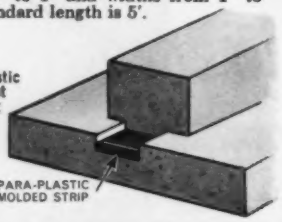


Molded Para-Plastic is a preformed elastic sealing strip composed of rubber, asphalt and other materials, molded in a rectangular shape. Properly installed, Molded Para-Plastic will bond securely to concrete to form a resilient and moisture-tight seal of the joint.

Because it incorporates sealing surfaces on all sides, Molded Para-Plastic effectively seals keyed construction joints and foundation footings. Not recommended for use when the surface is exposed or hydrostatic pressure is present. Available in thicknesses ranging from ¼" to 1" and widths from 1" to 12". Standard length is 5'.



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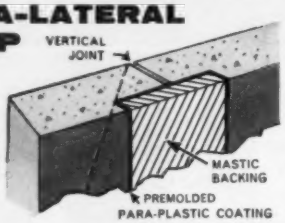

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News of Members

(Continued from page 22)

T. L. Cordle will serve for a two-year term ending in 1963 as vice president of the Illuminating Engineering Society's Southeastern Region. An associate and manager of the Electric Department of J. N. Pease and Company, in Charlotte, N.C., Mr. Cordle from 1948 to 1951 in addition to serving as a resident engineer for J. N. Pease was in private consulting practice. This had been preceded by employment as city manager and engineer in Lancaster, S. C., and Morganton, N. C.

Walter B. Sinnott, an associate in the firm of Hazen and Sawyer, consulting engineers of New York City, is a new member of the Harrison (N. Y.) Board of Zoning Appeals. In 1960 Mr. Sinnott spent six weeks in South Vietnam, making a study of the water supply problem for the capital city of Saigon.

J. D. Kirkgard, employed by Le Roy Crandall & Associates, of Los Angeles, Calif., for the past six years, was recently made an associate in the firm. Mr. Kirkgard is currently president of the Associate Member Forum of the Los Angeles Section.

Porter W. McDonnell, Jr., effective September 1, is the new chairman of the civil engineering technology program at the Ohio College of Applied Science in Cincinnati. Recently he was product manager of surveying equipment for the Eugene Dietzgen Company in Chicago, preceded by five years as a faculty member of the University of Arizona in Tucson and the Case Institute of Technology in Cleveland.

John B. Herbich, associate professor of civil engineering and chairman of the hydraulics division of the Fritz Engineering Laboratory at Lehigh University, with the assistance of a Ford Foundation Fellowship, will take part in a workshop on the programming of computers at the University of Michigan College of Engineering in early September. At Lehigh since 1957, he previously conducted research at the Imperial College of Science and Technology in London, England; at the University of Delft in Holland; and at the University of Minnesota in Minneapolis.

J. H. Porteus has been promoted by the Dravo Corporation from assistant chief design engineer of the Machinery Division to chief development engineer-ore processing. Before joining Dravo in 1951 he was principal engineer for Jackson & Moreland.

[Editor's Note: From time to time individuals forward requests to Society Headquarters for background or biographical data of famous members, past and present, of the Society. One such request has been received from Judith Kramps, concerning printed biographies of men who might have worked closely with the late members, G. W. Vaughn or C. G. Vaughn. If you have helpful information, contact Miss Kramps—not the Society—at 2206B Ivy Place, Albuquerque, N. Mex.]

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More than one million Americans are living proof. Remember . . . your contributions helped save many of these lives. Your continuing contributions are needed to help discover new cures and, ultimately, the prevention of cancer itself • Remember, too, if you delay seeing your physician, you drastically cut your chances of cure. Annual checkups are the best way of detecting cancer in time • Guard your family! Fight cancer with a checkup and a check.

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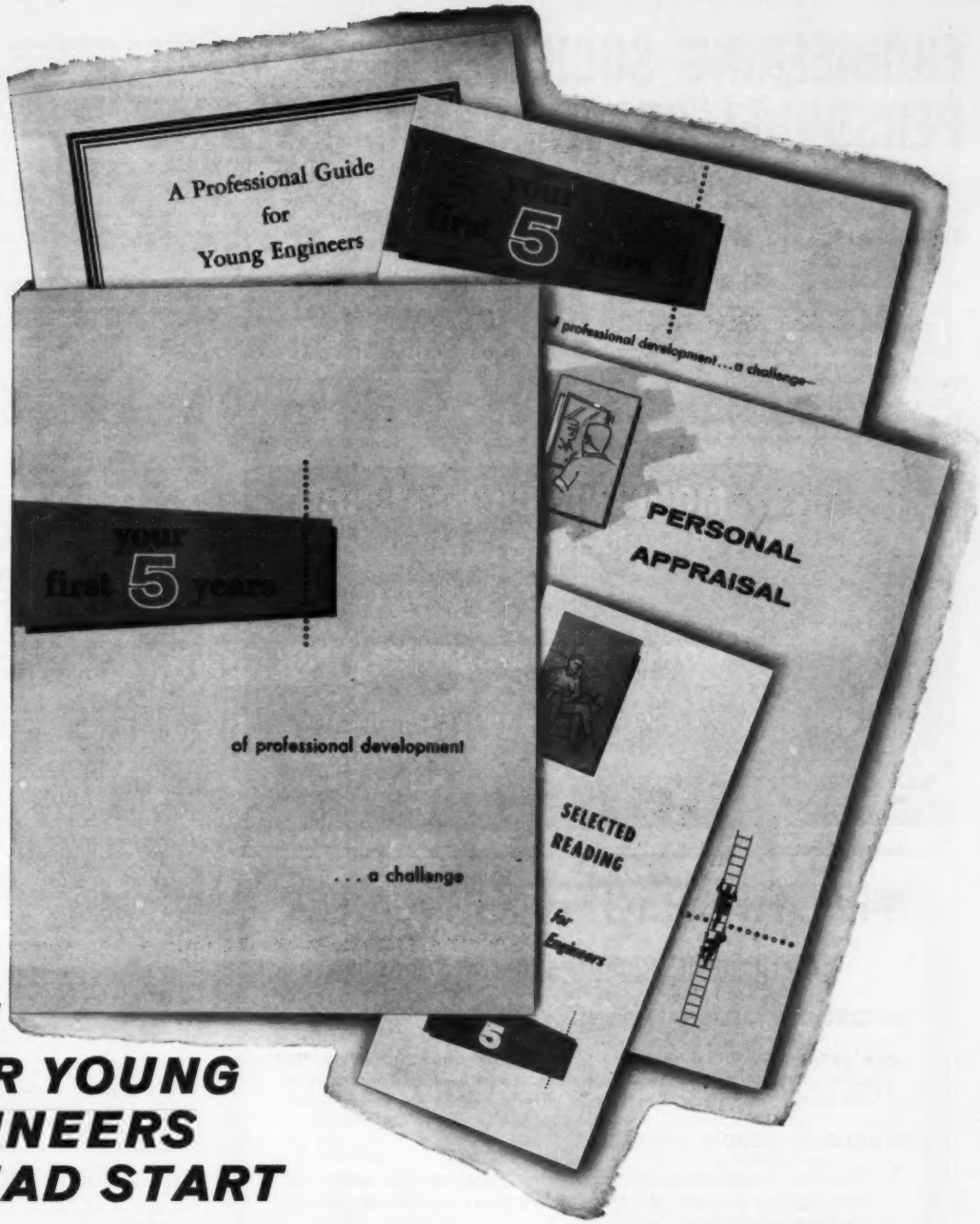

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The complete kit contains a 48-page reference manual, a statement of the responsibilities and ethical principles of the engineering profession, a selected reading list, a personal appraisal booklet, and a brochure outlining the complete six point program.

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These items are listings of the Engineering Societies Personnel Service, Inc. This Service, which cooperates with the national societies of Civil, Chemical, Electrical, Mechanical and Mining, Metallurgical and Petroleum Engineers, is available to all engineers, members or non-members, and is run on a nonprofit basis.

If you are interested in any of these listings, and are not registered, you may apply by letter or resume and mail to the office nearest your place of residence, with the understanding that should you secure a position as a result of these listings you will pay the regular placement fee. Upon receipt of your application a copy of our placement fee agreement, which you agree to sign and return immediately, will be mailed to you by our office. In sending applications be sure to list the key and job number.

When making application for a position include eight cents in stamps for forwarding application.

Men Available

EXECUTIVE ENGINEER, F. ASCE, B.S. Twenty-six years designing and supervising construction for electronics corporation, consulting engineers, general contractor, oil company, U.S. Army Corps of Engineers and real estate firm. Salary, $13,000. Will relocate. C-706.

CIVIL ENGINEER, A.M. ASCE, B.S.C.E., 31. Eight years, mostly abroad, as design and resident engineer for highways, earthwork, subdivision, and process plants. Salary, $10,000. Prefer, Southwest or Foreign. C-707.

ASSISTANT SUPERINTENDENT OR FIELD ENGINEER, A.M. ASCE, B.S.C.E., Ten years of experience in general industrial and commercial construction, also supervision, cost control, estimating, layout and labor relations. Salary open. Prefer Foreign, but will relocate anywhere. C-708.

STRUCTURAL/CIVIL ENGINEER, Student Member ASCE, B.S.C.E., Expects M.S.E., in Civil Engineering (Structural Engineering) in August 1961. Two years of experience. Salary, $6,000-$6,300. Willing to work anywhere in U.S.A. or abroad. C-709.

PRELIMINARY DESIGN OR ADMINISTRATIVE ENGINEER, M. ASCE, B.S.C.E. Twelve years of experience in highway design, construction, soils, training and administration. Salary, $9,500. Prefer East. C-710.

STRUCTURAL ENGINEER, Head of Department or Charge of Project, M. ASCE, B.S.C.E., Registered structural engineer in Illinois, 34. Fourteen years of experience, three of them as head of structural department of established industrial consulting firm and eight years as squad boss on major projects for large power plant design corp. Prefer Chicago area. C-2213-Chicago.

COMPUTER SUPERVISOR, A.M. ASCE, M.S.C.E., 30. Desires position as supervisor of electronic computer section. Four years' experience in solving and programming engineering problems on IBM 650 and 1620 computers. Capable of organizing an efficient computing section in connection with machinery requirements, staffing, utilization and programming. Salary, $9,000. C-2231-Chicago.

ENGINEERING MANAGER, F. ASCE, M.S.C.E., Reg. P.E., reg. public surveyor, commercial pilot, 54. For past year lecturing at large engineering school, previously three years as supervisor of heavy construction, nine months in England and North Africa. Altogether 30 years' experience, photogrammetry, surveying and mapping. Also interested in airport design and construction. C-2232-Chicago.

CONSTRUCTION ENGINEER OR ASSISTANT PROJECT MANAGER, A.M. ASCE, B.S.C.E., 32. Two years' experience as superintendent and project coordinator and eight years in construction prior to schooling as building tradesman. Salary, $8,500. C-2233-Chicago.

CONSTRUCTION ENGINEER, A.M. ASCE, B.S.C.E., E.I.T. Certificate, private pilot, 27. Three years' experience working for a small municipality in design, supervision of construction and maintenance of all phases of public works. Extensive experience in construction and property surveys. Able to coordinate and carry out work schedules. Salary, $8,000. Prefer Midwest or East. C-2234-Chicago.

CHIEF OR SENIOR ENGINEER, F. ASCE, M.S.C.E., 51. For 21 years in Corps of Engineers, U.S. Army, another four as Associate Professor of Civil Engineering and approximately two as Senior Engineer in a firm of consulting engineers. Salary $10,800. Will relocate. C-2235-Chicago.

CIVIL ENGINEER OR CONSTRUCTION ENGINEER, A.M. ASCE, B.S.C.E., 24. Three and a half years of experience in civil engineering design, construction and coordination on government-type construction plus design and construction experience in housing developments. Salary, $7,800. Prefer Texas or Louisiana. C-2237-Chicago.

CONSTRUCTION MANAGER OR ENGINEER, F. ASCE, B.S.C.E., registered, 53. Twelve years' experience in key positions on steam-electric power plants; 15 years on industrial highway, airbase and structural projects. Salary, $14,000. Will relocate. C-2238-Chicago.

EXECUTIVE, M. ASCE, B.S. and M.S. in Civil Engineering, 46. Spent 21 years with Corps of Engineers on varied engineering assignments in U.S. and Foreign. Experienced as engineer-manager in all aspects of water uses and management including waterways and ports. Qualified for municipal engineer, planning and management. Salary, $12,000-$15,000. Will relocate. C-2239-Chicago.

CONSTRUCTION ENGINEER, A.M. ASCE, B.S.C.E., licensed structural engineer and P.E., 31. Over six years' experience as structural engineer in the design of industrial, commercial and institutional buildings and special structures of steel, concrete and timber; was self-employed as a conultant to contractors on cofferdam designs. Prefer Chicago. C-2240-Chicago.

ENGINEER, Structural Design and Stress Analysis, B.S.C.E., A.M. ASCE, 24. Am responsible

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Major design and supervision of design for dams, power plants, canals and other hydraulic works. Must be top man, minimum of ten years experience, capable of directing and producing work.

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Planning, investigations, design of dams, power plants, canals and other hydraulic works. Minimum of five years experience. Several positions available.

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Design of large gates, valves, power plant mechanical equipment and related work on hydraulic projects. Some experience desirable.

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for design and analysis covering drilling derricks and masts and their supporting structures; applications include off-shore locations and floating vessels. Duties include supervision in connection with preparation of details for shop fabrication. Salary, $7,500. Prefer, West or Midwest. C-2241-Chicago.

CIVIL ENGINEER, F. ASCE, licensed N.Y., N.C., Va., Md., Neb., D.C. and Ohio; national certificate of qualifications, 59. For over 30 years in private and public practice; Administrative and supervisory experience in diversified fields, such as turnpikes, airfields, sports arena; water, sewage and waste treatment; dams and water supply; planning, estimating, investigations, reports and contracts; expert at specifications and supervision of construction. C-711.

FIELD OR OFFICE-ENGINEER OR CONSULTANT: A.M. ASCE, CE, Reg. P.E. Washington, 33. For eight years field, office and senior, supervised construction of hydroelectric projects for consulting engineer including change orders, specifications, field supervision of architectural, hydraulic model studies, some structural design as field, office and senior engineer. Two years land subdivision and development work. Salary, $10,600. Se-1723.

DESIGN AND STRUCTURAL ENGINEER, A.M. ASCE, CE, 27. Two and one-half years' experience designing and estimating heavy steel frame buildings, and light industrial and farm-type steel architectural buildings, plus two years designing structural components of heavy earthmoving equipment. Salary open. Prefer San Francisco area. Se-155.

STRUCTURAL AND SANITARY ENGINEER, M. ASCE, CE, 28. Four years of design detailing, inspection of one and multi-story buildings, one year as project engineer in building construction. One year as field sanitary engineer, and two years as structural draftsman. Salary, $12,000. Prefer Foreign. Se-1789.

FIELD OR ESTIMATING ENGINEER, A.M. ASCE, CE, 27. One year designing, drafting, estimating storm and sanitary sewers for consultant, one year in aircraft and one year of treatment plant operations. Salary, $500 per month. Prefer West Coast. Se-259.

CONSULTING OR CONTRACTOR CIVIL ENGINEER, A.M. ASCE, CE, 26. Four years on all phases of civil consulting, and two years in structures, sewers, culinary storage. Salary $8,000. Prefer West or Foreign. Se-1192.

Positions Available

ENGINEERS. (*a*) Associate Engineer, with experience relative to airport planning and/or construction. Must have administration and organization capability. (*b*) Assistant Engineer, experience similar to above except that the requirements and qualifications may be somewhat lower. Salaries open, dependent upon qualifications and ability. Locations, respectively, South America (required a knowledge of Spanish), and Middle East. F-649.

ENGINEERS. (*a*) Structural Designer, graduate C.E. with five years' experience on the design of industrial institutional and commercial buildings for a firm of engineers and architects. (*b*) Senior Architectural Draftsman, minimum of five years' experience on above. Salary open. Location, Connecticut. W-642.

PARTY CHIEF, familiar with high curve work—viaduct job. Salary, $7,800. Location, New Jersey. W-639.

STRUCTURAL DESIGN ENGINEER, B.S.C.E., with a minimum of three years' experience in the preparation of design calculations and design drawings for all types of structures, buildings and foundations. Must be familiar with and capable of applying design formulae and properties of materials for various structural elements, such as steel, concrete, wood, aluminum, etc. Salary, $8,400 and up a year. Location, western Pennsylvania. W-637 (*a*).

SENIOR SOILS ENGINEER, P.E., with seven to twelve years' experience in the geotechnical field, particularly concerned with problems associated with earth and rock-fill dams, tunnelling operations, large-scale grouting problems, channel construction, retaining wall problems, cofferdam problems, and foundations for powerhouses, intakes and switching stations, etc. Salary, $9,600-$12,000. Location, Canada. F-633.

ENGINEERS. (*a*) Chief Estimator, P.E., with experience in highway and expressway projects, to assume complete responsibility for direction of a division for a consulting firm. $12,000-$15,000 a year. (*b*) Chief Specification Writer, same as above. Employees know of this ad. Location, New York, N.Y. W-629.

CIVIL ENGINEER, professional registration. Experience should include employment with a nationally known firm of consulting engineers and direct participation in both design and supervision of construction of modern highway projects of interstate standards. Entire career should be one actively engaged in engineering work.

(Continued on page 146)

SANITARY ENGINEER II needed by STATE OF ALASKA

Salary: $840—$1005 per month

THIS POSITION has responsibility for planning program and activities in field of waste disposal and water resources management for State Health Agency. Program content and scope is coordinated with Federal Water Pollution Control activities and takes part in State phase of Federal WPC Construction Grant program. Position is responsible for field surveys and reporting on water quality for the State, for inspection and enforcement in pollution problems on State level and coordinates and consults with local level health agency activities in waste disposal problems.

IT INVOLVES consultation with professional engineering concerns on design and operation of treatment facilities for municipal sewage, industrial wastes, and State and Federal Government installations including facilities for radioactive wastes.

THE POSITION carries out plan review activities for these facilities and should also include promotion for or active research work on special problems.

Requirements: Graduation from college with engineering degree; registered professional engineer eligible for Alaska registration; six years of experience in professional sanitation engineering.

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VICE PRESIDENT, graduate civil, to head up a West Coast construction company specializing in residential, commercial and industrial construction for large Eastern real estate management corporation. Should live in the West and have background in real estate, zoning, FHA, in addition to construction. Salary, $20,000. W-606.

RECENT GRADUATE ENGINEERS, mechanical or civil, or to two years' experience, for plant maintenance or construction, to estimate and direct construction, new and alteration of buildings and grounds. Some knowledge of electrical codes desirable. Salary, $7,000-$7,500. Location, Queens County, N.Y. W-593.

ENGINEERS. (*a*) Senior Engineer, graduate civil or mechanical, with five to ten years' experience in the design, procurement and construction of cryogenic, chemical or petrochemical plants which must include on-site construction experience as a construction or resident engineer. Will assist construction supervisor on matters pertaining to procurement, inspection, construction, planning, scheduling and related items during design, construction and start-up of various sized cryogenic plants. Salary, to $10,500. Periodic field trips. (*b*) Senior Engineer, graduate civil or mechanical, with five to ten years' experience in the design, procurement, construction and estimation of cryogenic, chemical or petrochemical plants with emphasis on work as an estimator. Duties will include preparation of "Order of Magnitude" and "Definitive" estimates for total capital expenditures. Salary, to $10,500. Location, Central New Jersey. W-580.

TEACHING POSITION, Civil Engineering, M.S. minimum requirement, to teach general civil engineering subjects in small department. Salary and rank open. Starts in Fall, 1961. Location, Midwest. W-578.

CIVIL ENGINEERS. (*a*) Draftsman, with three to five years' experience on highway work. Salary, $9,000. (*b*) Water Supply Engineer with five years' experience in rural water location and supply. Must have a P.E. license. Salary, $13,500. Location, Southeastern Asia. F-560.

PROJECT ENGINEER, graduate civil, for consulting engineering doing all types of sanitary work, field as well as design work. Salary open. Location, Northern New Jersey. W-547.

OFFICE ENGINEER, graduate C.E. or M.E., with two to five years' experience, some of which has been in quantity survey or estimating, preferably with large company. Company is engaged in heavy construction work such as sewage and water treatment plants, pumping stations, small bridges and drainage projects. Preference will be given to one with design experience in this type of work. Employer will pay fee. Salary, about $8,000. Location, Memphis, Tenn. C-8736.

ENGINEERS. (*a*) Senior Arch Dam Designer, graduate C.E., with ten or more years' in arch dam design. Must be registered C.E. Salary, $10,000-$12,000 plus bonus. (*b*) Specification Writer, prepare specifications on all types of civil engineering projects including water works, sewage treatment plants, bridges, dams, etc. Must be cost conscious. Employer will negotiate placement fee. Salary, $10,000-$12,000 plus bonus. Location, Washington. C-8724.

This is only a sampling of the jobs available through the ESPS. A weekly bulletin of engineering positions open is available at a subscription rate of $4.50 per quarter or $14 per annum, payable in advance.

TEACHING-SANITARY ENGINEERING. To supervise a program of graduate and undergraduate teaching and research. Opportunity for consulting and full professorship available. Salary, to $11,000 on 9 month basis. Location, Midwest. C-8750.

DESIGN ENGINEER, CE, U.S. citizen. Competent harbor engineer, immediate field assignment to collect and evaluate field date on materials, surveys, foundations investigations, construction methods and costs; prepare chematic plans. Emphasis on preliminary plan and design, constructing knowledge helpful, for architect and engineer. Should be single or no children. Salary, $2,000 per month. Prefer Foreign. Sj-6303.

DESIGN SANITARY ENGINEER, CE plus advanced sanitary study, to 50. About ten years practice with feasibility studies, consulting, engineering services, design and professional counsel on water treatment, sewage and sewers for a consultant. Able to direct layout and supervise. Salary, $10,000 to $12,000. Location, Northern California County.

DESIGNING ENGINEER, degree preferred. Experience in field and design, detail heavy concrete forms, shoring, scaffolding for bridges, sewage plants, flood control for a constructor-engineer firm. Travel to job site to confer and assist. Salary $750-$1,000 per month. Location, San Francisco Peninsula. Employer pays fee. Sj-6370.

SENIOR DESIGN AND CIVIL ENGINEER, CE, to 50. Two to six years consulting office in water supply, drainage, and subdivision. For a consultant. Salary, $700-$800 per month. Location, Orange County, Calif. Sj-6319.

RESIDENT AND GENERAL BUILDING ENGINEER, CE, U.S. citizen, young. Two to five years field office to assist resident on conformance with specifications, job progress, change order, dealing with principals, architects, engineers, contractors for a prime contractor on lab building. Will work from drawings and specifications on site, building, steel, concrete; some pipe, heat, ventilate, air condition, and equipment. Security clearance. Transportation paid. Salary $700 up. Location, Southern California. Sj-6200.

OFFICE ASSISTANT, CE, 25-35. Preferably two years of lay out and detail reinforced concrete pipe experience on water lines, sewers, drains or culverts. Work on board and assist with engineering. Promotion to checker then application engineer. For a pipe manufacturer. Salary, $600 to $650 per month. Location, Alameda County, Calif. Sj-6235.

ASSISTANT HIGHWAY OR HARBOR ENGINEER, CE or equivalent, to 35. Highway grades, jetties, water front, harbor work for a large contractor. Location, Long Beach, Calif. Sj-6283.

HIGHWAY ENGINEER, CE, young. Two or more years of field, highway office or heavy construction experience, including quantities, falsework, design, equipage and materials control or expediting for a general contractor. Salary, $500 per month. Location, San Francisco. Sj-6348.

BRIDGE DESIGN ENGINEER, CE, Structural, 35-45. Ten years on fabricated bridges with thorough knowledge of design, erection, metal fabrication, aluminum, also familiarity with highway specifications, engineering and purchasing channels. Will coordinate technical assistance for fabricator designer, state officials for use of aluminum bridges involving unique principles. For a manufacturer-engineer-builder. Salary, $15,000. Location, New York. Sj-6406.

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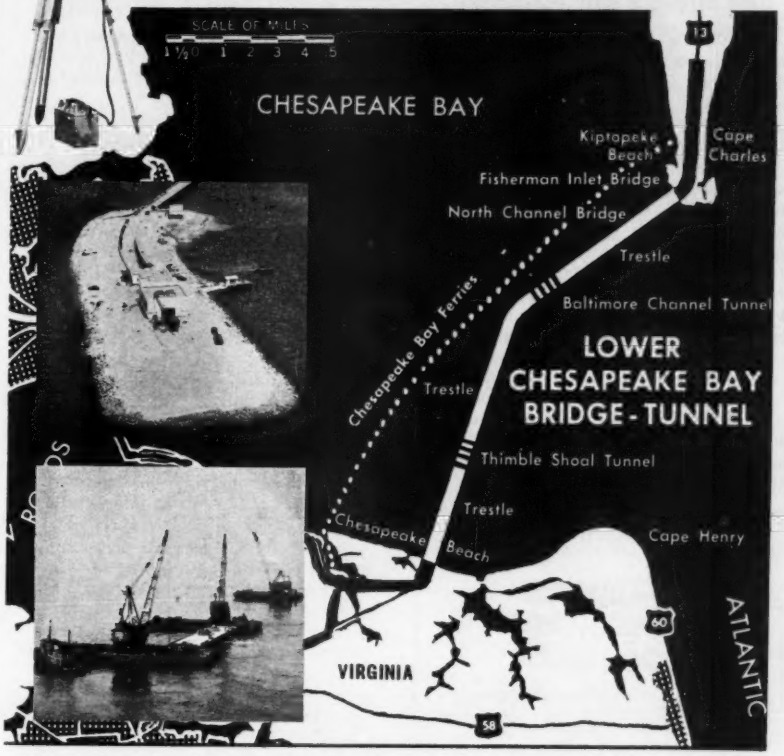

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EQUIPMENT, MATERIALS and METHODS

NEW DEVELOPMENTS OF INTEREST AS REPORTED BY MANUFACTURERS

High Strength Bolt Tensioning

THE USE OF HIGH STRENGH BOLTS has steadily increased since 1954. Under the 1960 specifications for structural joints using ASTM A-325 bolts, the tightening of these bolts to 100 percent of proof load has been approved. The Research Council on this project, in its report, has omitted torque specifications and endorses the calibrated wrench and turn-of-nut methods for bolt tightening. However, there are limitations to this method since the proper procedure must assure that the nut is in a "snug" condition; otherwise turn-of-nut may only overcome burrs, bending or other irregularities. (Fig. 1) Therefore, there are two things that are required for bolt tensioning: A controlled wrench that senses bolt tension regardless of assembly variables; and a means of proving the tensioning of each bolt after the assembly has been completed.

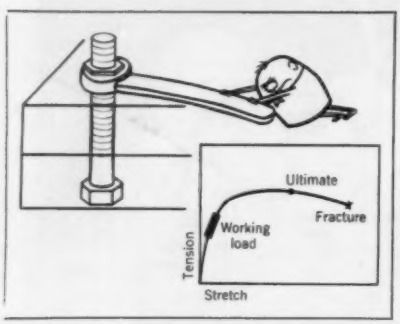


Fig. 1

The only way to control bolt tension is to control the energy output of the tool. This is done by a Gardner-Denver wrench, which provides positive control. There is nothing mechanical in the control to fail or lose adjustment. The variables that affect torque (rust, scale, etc.) are irrelevant when using the tension control wrench and stretching the bolt to yield.

The area between yield and failure is called the plastic range. A bolt may be stretched into this area with no danger from overstressing until ultimate is surpassed. (Fig. 2) With the Gardner-Denver tension control wrench, an operator can pre-stress a bolt to a load greater than the fluctuating load which will be applied to the bolt. In theory, this bolt will never fail.

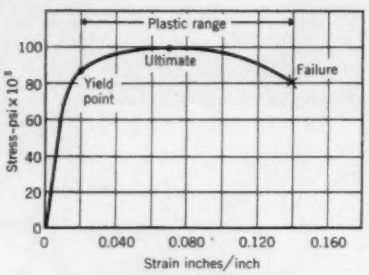


Fig. 2

In testing the wrench, Gardner-Denver engineers stressed thousands of bolts, using a series of same-size bolt and varying-size bolts. In every test, results confirmed the ability of the wrench to provide controlled tension. Tests were conducted using bent washers, hardened and soft washers, mashed and deformed threads, with and without lubricant. In addition, it was found that variations in air pressure from 70 to 100 psi did not materially affect the tensioning of the bolts.

To prove on-the-job tension, Gardner-Denver recommends two simple methods:

1. One is called the "reverse turn-of-nut".
   a. After all bolts have been tightened, loosen one bolt at a time and check the reverse turn-off nut from tight to snug.
   b. Once the degree of turn has been established, this can be used to prove the bolt has been taken to yield.
2. The other proving method is called "nut-creep".
   a. Once a bolt is tightened beyond its elastic limit, it will not return to its original length.
   b. Loosen the tightened bolt to hand tight.
   c. Mark the wrench socket and work.
   d. Retighten the bolt with the tension control wrench until there is loss of socket rotation. (Bolt Yield)
   e. Loosen again and check the socket in the hand tight position. If the bolt is yielding, a definite gain ("nut-creep") in nut position will be noted.

Once the accuracy of the tension control wrench is accepted, there is even a simpler way to check tension. Using a second wrench, adjust it to give the tension desired from the wrench on the job. After being assured this wrench is properly adjusted, use it to loosen and retighten sample on-the-job bolts. If it gives the same results as the first wrench (from markings on nut and work) the tensioning of bolts in the assembly is accurate. **R. I. Swanson, Development Engineer, Gardner-Denver Company, CE-9, 100 Williamson Street, Quincy, Illinois.**

Water Treatment

THE LABORATORY CONTROL CONCEPT, a different concept in water treatment plant design and control, has condensed and concentrated years of experience in water filtration and treatment. It features the idea of finger tip control over plant throughout, chemical additions and filter backwash from a single console in the laboratory. The console controls the pacing of chemical feeders by flow and automatically controls filter backwash programs through each phase, assuring high quality effluent. **B-I-F Industries, CE-9, Providence 1, Rhode Island.**

Scratch Depth Gage

THIS GAGE, which measures scratches, grooves, and other indentations on flat or curved surfaces, was designed primarily for the inspection of materials, (wing skins of aircraft, high pressure pipe and tubing, etc.). Precise measurements to an accuracy of plus or minus 0.0001 in. or 5 percent of the depth, whichever is greater, can be made for indentations with a depth from 0.0002 in. to 0.016 in.; widths from 0.001 to 0.50 in. can be determined to plus or minus 0.001 in. The same range applies to the measurement of raised portions. In addition to depth and width measurements, the gage shows the contour of the indentation. The battery-operated unit is equipped for examining flat surfaces, but the base is easily removable for the substitution of special adapters when inspection of rods, tubing or other curved surfaces is required. **Bausch & Lomb Inc., CE-9, Rochester 2, New York.**

Compact Chlorinator

THE ADVANCE 200 SERIES CHLORINATOR, which feeds up to 50 lb per 24 hrs in three ranges, is applicable for small water and sewage treatment installations. The standard system is a vacuum operated solution feed with spring opposed diaphragm regulators and check valves. It can be connected directly to the chlorine cylinder eliminating dirt and corrosion found in manifold-type systems. A double-action inlet valve operates in one direction to regulate and reduce pressure and has a bubble-tight safety shut-off valve. In the other direction, it seals the system under vacuum when gas supply is exhausted or shut off. **Capital Controls Company, Inc., CE-9, Department M-5, Jones Avenue, West Point, Pennsylvania.**

Rollers for Tractor-Type Dam Gates

TRACTOR-TYPE GATES for the Oahe Dam (near Pierre, South Dakota) are designed to carry a hydro-static load of over four million lb. This load is transmitted from the gates through a series of rollers to concrete-imbedded tracks on the gate frames. The main problem concerned the demands to be made on the rollers, besides the tight dimensional tolerances and close alignment required.

Stainless Steel Rollers

Armco Stainless Steel, 17-4 PH, Condition A, was machined into 5-in. dia rollers and given a 900 deg F. precipitation hardening treatment, which developed a hardness of 385-418 Brinell. No refinishing or final machining was needed. With this method, the width of individual rollers was reduced over 25 percent, thus permitting the use of narrower track. Improved corrosion resistance to constant immersion in river water was also noted. **Armco Divisions, Armco Steel Corp., CE-9, 1939 Armco Avenue, Middletown, Ohio.**

Pile-Driver Steam Hose

A BURST-PROOF STEAM HOSE for use in heavy construction is designed for saturated steam at pressures up to 200 lb. (366 deg F). The tube is of thick neoprene lined with asbestos fabric and heavy gauge flat steel spirals. The strength member is two braids of high tensile, multiple strand, non-corrosive steel wire. There is no close-off, even with short radius bends. The cover is oil-proof neoprene that has high resistance to checking and abrasion. It is crush-proof and completely resistant to the harmful effects of oil. **Raybestos-Manhattan, Inc., Manhattan Rubber Division, CE-9, Passaic, New Jersey.**

Flooring Composition

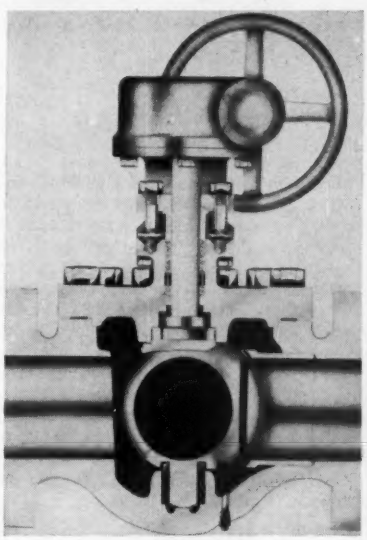
TEXALL IS A TWO PART COMBINATION consisting of mineral aggregates and cement, and chemically reactive emulsion. This mixture produces a hard mastic gel that binds the constituent parts into a plastic mass of great strength. Upon curing, it remains resilient, yet non-compressible. When applied by trowel it forms a monolithic, level surface over old concrete or wooden floors, fully protecting and providing an indestructible floor resurfacer. It is non-slip under wet or dry conditions and requires little maintenance. **Garon Products Inc., CE-9, Longfellow & Viele Avenues, Bronx 59, New York.**

Headlight Barrier System

THE ALCOA GLARE SCREEN, is the headlight barrier system installed in the medial strip of heavily traveled main roads. It consists of an aluminum expanded metal mesh fence, 4 ft high, which effectively blocks out light from oncoming vehicles. Although it blocks direct headlight glare, the screen allows an almost unimpeded vision of the surrounding countryside, when viewed at an angle of about 90 deg. This screen is virtually maintenance free since it requires no painting and has a life expectancy exceeding 40 years. **Alcoa Aluminum Co. of America, CE-9, 1501 Alcoa Bldg., Pittsburgh 19, Pa.**

Ball Valve

IN THE LUDEMAN ROTOFLO VALVE, the cam action of the stem lifts the ball away from the seat before it is turned, eliminating the sliding friction that wears and scores the seats of other ball valves. It also permits the use of hard metal-to-metal seating surfaces, which assure tight shut-off and permit the valve to be used at high temperatures. Other design features include a full-round flow passage equal to 100 percent of the pipe area, fast opening and closing, and a locking action that insures tight shut-off, even when line pressure is reversed. The valve is designed for use in oil and gas pipeline applications, petroleum and chemical industries, pulp and paper mills, and other fluid and gas processing industries. **General Kinetics Corp., CE-9, 197 South Van Brunt Street, Englewood, New Jersey.**



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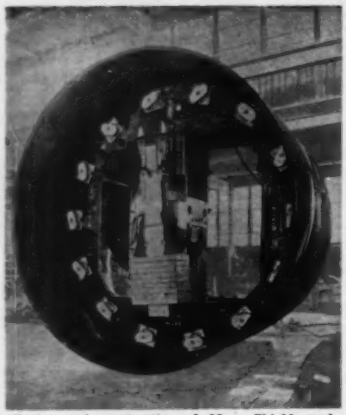

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EQUIPMENT, MATERIALS and METHODS

(continued)

Guardrail Maintainer

THE GUARDRAIL MAINTAINER is a machine designed to wash guardrails, scrape off old paint and repaint guardrails of all types. Tests indicate that a ten mile stretch can be completely refurbished in less than 3 days, with a crew of only 3 men. Consisting of five separate components, the machine is designed to perform one operation at a time, while being propelled by a vehicle. The three operations are performed at the front of the truck by a telescoping boom and extension arm assembly that attaches in place of the front bumper. A 675 gal water tank and supporting power-pack complete the machine make-up. **Ross and White Company, CE-9, 400 West Madison Street, Chicago 6, Ill.**

Guardrail Maintainer in Action

Dry Lubricant

DRI-SLICK, a graphite lubricant, is applied with a brush to metal or wood and dries to a hard, slick finish in about 30 min. The material has been formulated to overcome sliding friction problems on heavy industrial, construction or mining machinery, such as, conveyors, chains, wire rope, outdoor cranes, large open gears and sliding door channels. The dry coating cannot be squeezed out under heavy loads, does not attract dust and dirt, will not wash off, is corrosion resistant, electrically conductive, and stands up under temperatures from −65 deg F to +800 deg F. **G. W. Smith & Sons, Inc., CE-9, 1700 Spaulding Road, Dayton 32, Ohio.**

Sunscreen

KOOLSHADE SUNSCREEN, made by Reflectal Corporation, operates like a miniature venetian blind installed outside the sun exposed windows. It consists of tiny horizontal bronze louvers just $\frac{1}{20}$ in. wide and $\frac{1}{200}$ in. thick. Locked permanently in place by vertical warp wires spaced $\frac{1}{2}$ in. apart, the louvers are spaced and tilted at the exact angle to screen out the maximum amount of solar heat and glare. The screening is mounted in aluminum frames custom fitted to each window. The sunscreen affords high outward visibility, since it screens out direct solar rays. The light coming in through the windows is evenly diffused and glare free. It also serves to screen out insects when windows are open. **The Biddle Company, CE-9, 212 E. Ontario Street, Chicago 11, Ill.**

Drawn Shoulder Spreading Machine

THE POWER-PACK Truck Drawn Shoulder Spreading Machine, Model 605, has increased its spreading width to 6 ft. The strike-off blade is adjustable to any width from 2 to 6 ft and hand screws control raising and lowering of the curved strike-off blade, permitting a constant grade up to 5 in. above or below grade. The unit attaches to any truck by means of two cables which are extended under the truck and hook onto the front bumper. Tensioning jacks position the machine snugging the rear wheels of the truck against hopper bumper rolls. All standard models are equipped with 12.5 hp Wisconsin gasoline engines, electric starter, generator and 12 volt battery. **Power-Pack Conveyor Co., CE-9, 836 E. 140th Street, Cleveland, Ohio.**

Ratchet Rotary Counter

A TALLY of the actual number of blows made by an automatic foundation drilling test unit is recorded by a Durant Model 6-C-3 ratchet rotary counter mounted directly on a soil boring machine. A weight is dropped a number of times from a given distance and its penetration into the ground is measured to give evidence of the structure of the foundation ground. The counter is mounted on a special plate at the control station of the unit. The lever arm of the counter is attached to a pin on the end of the shaft driving the cam that lifts the weight with each revolution of the shaft. **Durant Manufacturing Company, CE-9, 19 North Buffum Street, Milwaukee 1, Wisconsin.**

EQUIPMENT MATERIALS and METHODS

(continued)

Hydraulic Backhoe

A QUICK-DISCONNECT feature for 30-sec coupling, 12 ft 6 in. digging depth and a dirt ejector bucket, are features of a hydraulic backhoe for use on Caterpillar wheel loaders. Called the Ottawa LX backhoe, the unit fits Cat 922 and 944 wheel loaders as well as the 933 Traxcavator. The hydro-hitch allows the entire backhoe to be attached in 30 sec by pushing one lever to engage two cone mounting pins and latching quick release. Coupling the hydraulic lines completes the job. Reversing the process frees the loader for other work. Pickup or release can be handled on rough ground as the mechanism compensates for alignment. For digging, the backhoe has an 8 ft 6 in. dump height and 190 deg swing, right to left. With no loss of speed, the backhoe can exert 7000 lb force at the bucket cutting edge and hydraulic outriggers can be used to level the unit 10 deg. **Equipment Division, Young Spring & Wire Corporation, CE-9, Bowling Green, Ohio.**

Rotary Asphalt Cutter

A HIGH-SPEED ROTARY ASPHALT CUTTER, that enables a single operator to cut over 6000 lineal ft of asphalt paving an hour, can easily be attached to any piece of construction equipment having hydraulic down pressure. Known as Roto-Cut, the body of the unit, features one piece alloy

Roto-Cut Asphalt Cutter

steel construction. The oversize tool steel cutting wheel is differentially heat treated for self-sharpening characteristics. Special Lubri-Pin construction permits the wheel-axle assembly to be lubricated in just a few seconds. **Allied Steel & Tractor Products, Inc., CE-9, 7835 Broadway, Cleveland 5, Ohio.**

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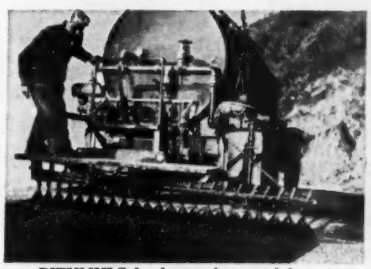

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Literature Available

CORRECT CYLINDER CASTING—Improper procedures employed in the casting of concrete cylinders will invariably produce low and erratic compressive strength results. Approved concrete cylinder casting procedures including selection of molds; correct sample taking; and filling, handling and curing of cylinders are outlined in this one page bulletin, RM-48. **The Master Builders Company, CE-9, Cleveland 18, Ohio.**

WIRE ROPE FOR STRUCTURAL USES—a 32-page booklet, No. 593, that focuses attention on the growing applications for wire rope and bridge strand as structural materials. Applications illustrated and described include suspended roofs, suspension bridges and other structural applications of wire rope dealing with aerial tramways, ski lifts, guys for transmission towers and giant antennas, tiebacks for supporting an arch truss bridge during erection and cable anchors for pontoon bridges. **Bethlehem Steel Company, CE-9, Publications Department, Bethlehem, Pa.**

PRESSURE PIPE—Transite Pressure Pipe allows economies of installation, maintenance and operation in water mains. The lightweight, long lengths of asbestos-cement pipe are tough, durable and strong, with accurate, time-saving Ring-Tite Couplings that assure quick assemblage. They have flexible joints, and make installation rapid, simple and sure because it's a machined joint. The "belled-ahead" pipe cuts down installation time. The booklet is TR-160A. **Johns-Manville, CE-9, 22 E. 40th St., New York 16, N. Y.**

AUTOMATIC PARKING SYSTEM—A bulletin containing information on a completely automatic parking system is now available. Included are various layouts of gate installations with a wide choice of controls for gate operations, such as: coin operation, ticket issuing system, time-dated ticket dispenser and coded card-key. **Parcoa Div., Johnson Fare Box Co., CE-9, 420 Lexington Avenue, New York 17, New York.**

HOW TO PREPARE STANDARD CALCIUM CHLORIDE SOLUTION—is a pamphlet prepared especially for ready mixed concrete producers. It contains illustrated recommendations for procedure in making solution, and a chart on recommended gal of solution per batch. **Calcium Chloride Institute, CE-9, 909 Ring Building, Washington 6, D. C.**

FIRE-SAFE CONSTRUCTION IDEAS IN ACTION—This illustrated folder tells how the Kroger Company saved time and cut costs by using Non-Com fire-protected wood as studding for the walls of a new store. The pictures show it being installed for permanent protection against fire, termites and decay. **Wood Preserving Div., Koppers Company, Inc., CE-9, 752 Koppers Building, Pittsburgh 19, Pennsylvania.**

Literature Available

DRAGSCRAPERS AND CABLEWAYS—A general folder covers in brief form: Drag-Scraper and Slackline Cableway Machines; Crescent buckets used with draglines; plus data on wire rope fittings and Durolite blocks. Photographs and line drawings show typical installations and illustrate the various methods of excavating and hauling. **Sauerman Bros., Inc., CE-9, 620 S. 28th Avenue, Dept. C-15, Bellwood, Illinois.**

SELF-BONDING RUBBER—A 4-page, illustrated technical bulletin describing the first of a series of self-bonding silicone rubber compounds is now available. The publication discusses applications for the materials and describes in full the simple technique for obtaining superior primerless bonds to ferrous-containing metals. Also included are several charts and tables showing typical properties. **General Electric, Silicone Products Dept., CE-9, Waterford, New York.**

STEAM JET BLOWERS AND BLAST NOZZLES—A bulletin, 4AB, which describes a line of Steam Jet Blowers and Blast Nozzles, that use pressure steam or compressed air to move large volumes of air in ventilating and circulating applications, is now available. Dimensions, weights and capacities are given for all sizes. **Schutte and Koerting Company, CE-9, Dept. JA-34, Cornwells Heights, Bucks County, Pa.**

ELECTRICAL WIRING IN FLEXICORE SLABS—A 16-page manual explains the use of hollow-core precast concrete floor and roof slabs as raceways for electrical wiring. Covered in the book are: ways to get wiring in and out of the hollow cells; how to feed fixtures from the cell and other methods commonly used for electrical wiring. Each section is clearly illustrated with detailed drawings. **The Flexicore Co., Inc., CE-9, 1932 E. Monument Avenue, Dayton 1, Ohio.**

AGGREGATE COATING—A technical bulletin is available covering Horn Aggretex "F", a coating for wood or metal forms used to obtain exposed aggregate surfaces on freshly poured concrete. Included is a description of the product, its use, surface preparation for wood and metal forms, method of application, coverage, packaging and shipping weight. **A. C. Horn Companies, Div. Sun Chemical Corp., CE-9, 2133 85th Street, North Bergen, New Jersey.**

VALVES—Three booklets, now available, are concerned with rubber seat ball valves and butterfly valves. Specifications, dimensions, applications and illustrations are included. **Henry Pratt Co., Inc., CE-9, 319 West Van Buren Street, Chicago 7, Illinois.**

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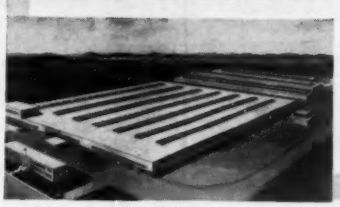

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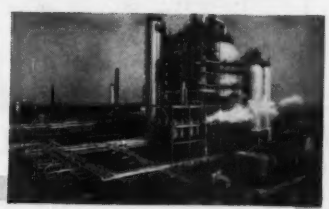

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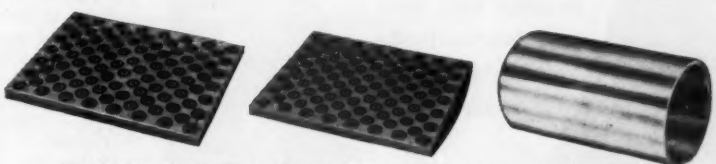

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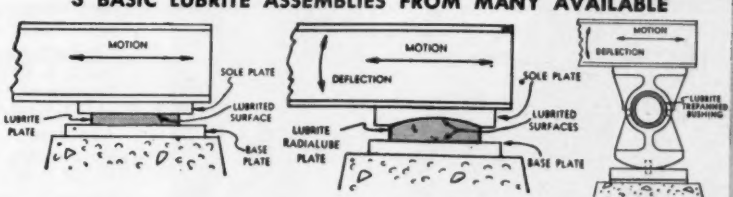

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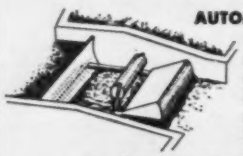

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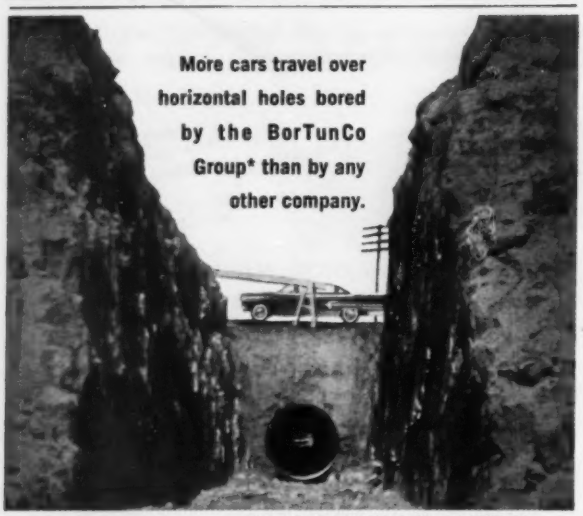

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From the MANUFACTURERS

EXPANSION: The Carborundum Company announced a $1½ million modernization and expansion of its Globar Electronics Plant . . . Joseph T. Ryerson & Son, Inc. has entered into the liftslab business . . . The establishment of an American branch of the Schwing Company, was recently incorporated under the name Schwing-American Corporation and will have its national headquarters in Rockford, Illinois . . . Thompson Materials Corporation of New Jersey has joined The Eastern Company of Connecticut . . . **NEW NAME:** Vitro Weapons Services has changed its name to Vitro Services . . . The A. O. Smith Corporation's Reinforced Plastics Division has changed its name to the Glass Fiber Products Division . . . **DISTRIBUTORS:** Rowand Machinery Company has been appointed distributor of the "Michigan" machinery line of the Clark Equipment Company . . . Constructors Equipment Co., Inc. has been appointed dealer for P&H construction and mining equipment manufactured by Harnischfeger Corporation . . . Miller Swivel Products, Inc. announces the appointment of Florida Wire & Rigging Works, Inc. as their master distributor . . . Worthington Corporation has appointed Copper State Tractor, Inc. as its distributor . . . Tri-State Tractor Co., Inc., has been appointed distributor for Bucyrus-Erie crane-excavator and Hydrocrane lines throughout the state of Georgia . . . Sanel Industrial, Inc. has been appointed dealer for FWD Corporation . . . **NEW OFFICES:** The Flexible Tubing Corporation has opened a sales and engineering office in St. Louis, Missouri . . . Certified Industries, Inc. has completed moving its administrative and executive offices from Commack to Hicksville, Long Island . . . The Westinghouse Air Brake Co. announced that its Le Roi Division operations will move from Cleveland to Sidney, Ohio . . . **ACQUISITIONS:** The Nalge Co., Inc. announces the purchase of the name, trademarks and assets of the American Agile Corporation . . . Tinker & Rasor has acquired the Detectron Company from Computer Measurements Corporation . . . Golden-Anderson Valve Specialty Company has anounced the purchase of Rotary Valve & Engineering Corporation . . . **MEETS TEST:** Compaction Engineering Company announces that Duo-Bond, the liquid admix for concrete, has met the requirements of the State of California, Division of Highways for structural concrete . . . **NEW TRADEMARK:** Wausau Iron Works will begin using a newly developed corporate logo on all products and printed material . . . The Flexible Tubing Corporation announces a new tilted oval trademark with white on a light blue background . . . **DEMONSTRATION:** Hobart Brothers Company will show and demonstrate their semi-automatic welder at the ASM Detroit Metal Show, October 23-27 . . . **APPOINTMENTS:** The appointment of Robert W. Heller as Western Regional Representative for Borg-Warner Alfol Insulation has been announced . . . The appointment of Joseph Graf as Domestic Sales Manager has been announced by Athey Products Corporation . . . David S. Moffit has joined Lock Joint Pipe Company as Director of Finance . . . Dane T. Scag has been appointed assistant director of research at Allis-Chalmers Mfg. Co. . . . Appointment of T. L. Kinch to the post of Advertising Director has been announced by Hamilton Kent Manufacturing Company . . . Joseph O. Sherod has joined Alpha Portland Cement Company as Director of Manufacturing . . . Don A. McAllister has been appointed industrial tractor and equipment sales representative of International Harvester Company's Farm Equipment Division . . . Robert Linquist has been appointed to the executive post of Vice President of Engineering at Security Valve Company . . . The Chicago Pneumatic Tool Company announces the appointment of Russell B. Miller to the position of General Sales Manager . . . J. M. Hollingsworth of Lone Star Steel Company has been promoted to Manager of the Spiral Weld Pipe Sales Department . . . Oscar Langheinrich has been appointed service manager for the Machine Division of Waller Corporation . . . Willard J. La Morte has been elected president of Shattuck Denn Mining Corporation . . . Kenneth R. Daniel has been elected Executive Vice President of the American Cast Iron Pipe Company . . . G. L. Werly Jr. has been appointed general marketing manager of Air Reduction Sales Company.

FINAL REMINDER:

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PROCEEDINGS AVAILABLE

August

Journals: Air Transport, Engineering Mechanics, Soil Mechanics and Foundations, Structural, Waterways and Harbors.

2875. Operative Energy Concept in Marine Fendering, by Shu-t'ien Li. (WW) This paper develops operative energy concept in marine fendering, variable design factors, and ship impact energy evaluation.

2876. Economic Evaluation of Inland Waterway Projects, by Shu-t'ien Li and Eric E. Bottoms. (WW) Basic data requirements for economic evaluation of inland waterway projects are summarized and some of the current evaluation practices are given.

2877. Steel Pile Marine Corrosion and Cathodic Protection, by Carter Hale Horton. (WW) Corrosion which occurs on marine structures, and the use of cathodic protection to prevent such corrosion are presented herein.

2878. Foundation Stability for a Submarine Liquid Sulphur Pipeline, by Basil W. Wilson (SM) This paper examines the vertical and lateral stability of a 7-mile long hot sulphur pipeline entrenched in sediments between Louisiana and an offshore sulphur mine.

2879. Torsional Behavior of Suspension Bridge Towers, by Frank Baron and Anthony G. Arioto. (ST) An interpretive study is presented of the influences of different variables on the torsional behaviors of suspension bridge towers.

2880. Hydrodynamics of Flow into Curb-Opening Inlets, by Richard J. Wasley. (EM) A theoretical analysis of the hydrodynamic problem associated with the curb-opening inlet is presented.

2881. Cohesion After Non-Hydrostatic Consolidation, by John H. Schmertmann and John R. Hall, Jr. (SM) The effect of non-hydrostatic consolidation on the cohesion and friction in two saturated clays was studied. The results showed that cohesion is unaffected by non-hydrostatic consolidation.

2882. Stability of Frames in the Presence of Primary Bending Moments, by E. F. Masur, I. C. Chang, and L. H. Donnell. (EM) A systematic method of analyzing the stability of frames against sidesway buckling is developed.

2883. Columbia River Ship Channel Improvement and Maintenance, by Robert E. Hickson. (WW) A practical solution for design of channel improvement and control works on the Columbia River and the beneficial effects of such works are described.

2884. Analysis of Frames Loaded into the Plastic Range, by Morris Ojalvo and Le-Wu Lu. (EM) A precise method of analyzing plane frames stressed into the inelastic range is presented. A complete example is included to illustrate the technique developed.

2885. Secondary Compression of Clays, by K. Y. Lo. (SM) Results of long term consolidation tests on five remolded and two undisturbed clays are reported.

2886. Corrosion of Steel Piles in Salt Water, by James R. Ayers and Ralph C. Stokes. (WW) This paper presents the results of a survey made by the Navy of steel sheet piling in bulkheads of eight widely scattered shore stations.

2887. Analysis of Noncoplanar Elastic Rings, by D. H. Pletta, W. C. Liessner, and Yen-Ming Yeh. (EM) The six scalar equations required to determine the components of the indeterminate moments and forces in loaded or distorted elastic rings are derived using vector algebra.

2888. Harbor Paradox, by John Miles and Walter Munk. (WW) Resonant frequencies that have been derived for rectangular harbors are studied.

2889. Conference Remarks Report of the ACC-ASCE Joint Conference Committee. (AT) The several introductory and background presentations made to the May, 1961 ACC-ASCE Joint Conference on Increasing Airport Capacity are presented in three sections: "Introduction," "Welcome," and "Airport Capacity and Safety."

2890. Determining Airport Needs for the Future, by George De Ment. (AT) Presents the steps in arriving at an airport master plan for an area outlined, including a traffic forecast and an existing-airport capacity determination.

2891. Importance of Regional Airport System Planning, by Ray O. Kusche. (AT) An adequate air transportation system will result in problems that call for joint action. Development of a plan is the responsibility of communities served by the airport.

2892. Airport Design by Economic Analysis, by Paul H. Stafford and Martin A. Warskow. (AT) The factors that affect practical airport capacity are enumerated, and quantitive examples of their effects are given.

2893. New Developments in Terminal Air Traffic Control, by Walter N. Pike. (AT) Studies are being made of the air traffic control problem on a total system basis. Recently developed equipment is described, and illustrations as to its use are presented.

2894. Trends in Aircraft Design Affecting the Airport, by Ralph T. Glasson, Jr. and Weldon E. Rhoades. (AT) The airlines and aircraft manufacturers are continually striving to meet and solve airport and noise problems, as is shown herein.

2895. Summary of Symposium on Supersonic Air Transport, by Reginald J. Sutherland. (AT) Aircraft manufacturers have studied problems that will develop with the introduction of supersonic passenger planes, including design and operation of these planes and the method of handling at airports.

2896. Location and Number of Exit Taxiways, by Robert Horonjeff. (AT) This paper describes the techniques applied to the evaluation of airport configuration from the standpoint of aircraft traffic potential.

2897. Aircraft Runway Arresting Barriers, by Apostolos H. Zonars. (AT) Aircraft runway arresting barriers consisting of two elements, the engaging device and the energy absorber, are described.

2898. Recent Developments in Airport Lighting, by D. M. Finch. (AT) Airport lighting problems are many and varied in complexity. The application of present knowledge to airports and aircraft should permit reliable operation in almost all weather conditions.

2899. Summary of Prestressed Concrete Pavement Practices, by Frank M. Mellinger. (AT) This paper, by means of references, summarizes the development of design criteria for such pavements and reviews the types of construction used for prestressed concrete runway and taxiway pavements.

2900. Need for More Air Terminal Gates, by Thomas M. Sullivan. (AT) The introduction of jet aircraft into existing terminal facilities has caused the handling of fewer planes from existing gates.

2901. Parking and Circulation of Vehicular Traffic at Airports, by Israel Gilboa. (AT) Methods and procedures for studying and evaluating vehicular traffic are indicated. The material can be used as a general guide for development of essential data pertinent to any airport.

2902. Field Study of a Cellular Bulkhead, by Ardis White, James A. Cheney, and C. Martin Duke. (ST) A detailed experiment analysis is presented of the structural behavior of a segment of a steel sheet pile cellular bulkhead.

2903. Dead-Load Stress in Model Dams by Method of Integration, by Jerome M. Raphael. (ST) An experimental technique is described for determining dead-load stresses in dams.

2904. General Solution of Space Frameworks, by Ignacio Martin and Jose E. Hernandez. (ST) The slope-deflection-gyration method that is applied to space frameworks is presented.

2905. Pile Heave and Redriving, by Earle J. Klohn. (SM) Detailed field data with analyses pertaining to pile-heave problems that developed during construction of end-bearing pile foundations for an industrial plant are presented.

2906. Grid Analysis by the Reaction Distribution Method, by Irving Fader. (ST) Presents a convergence process that is based on the stiffness characteristics of the members in the system.

2907. Uniformly Moving Load on a Layered Half Plane, by J. L. Sackman. (EM) Steady state displacements and stresses produced in a two layered elastic half plane are determined for dilatational and distortional potenials.

2908. Bending of Rectangular Plates, by Mournir Badir. (ST) Rectangular plates are solved numerically via a structural model.

2909. Conjugate Beam Simulated by Electric Circuits, by S. Freiberg. (EM) An analogy in beam bending is made with electric circuits. Voltages, currents, and resistances simulate moments, forces, and lengths.

2910. Further Studies of the Strength of Beam-Columns, by Robert L. Ketter. (ST) The results of an investigation of the ultimate carrying capacity of beam-columns are presented.

2911. Method of Internal Constraints and Its Application, by Enrico Volterra. (EM) An approximate method is presented and applied which unifies a number of engineering theories in the statics and dynamics of bar plates.

2912. Impact Waves in Sand: Implications of an Elementary Theory, by Blaine R. Parkin. (SM) A theoretical study of impact wave propoagation in dry sand compared with elastic and elasto-plastic theories of wave propagation.

2913. Strength of Plate Girders in Bending, by Konrad Basler and Bruno Thurlimann. (ST) The study of girders subjected to bending is used to derive a design concept.

2914. Discussion of Proceeding Paper 2423, 2658, 2729, 2733, 2749. (WW) Omar J. Lillevang on 2423. Omar J. Lillevang on 2658. Charles E. Behlke, John B. Herbich, and Alf H. Sorensen on 2729. Glenn B. Woodruff, Richard S. Winkler, and Joseph H. Finger on 2733. A. C. Rayner on 2749.

2915. Discussion of Proceedings Paper 2544, 2545, 2633, 2634, 2678, 2704, 2764. (ST) Donald A. Sawyer on 2544. Joseph Penzien on 2545. M. J. Gutzwiller and F. E. Musleh on 2633. Kurt H. Gerstle on 2634. George B. Begg, Jr. on 2678. M. Gregory on 2704. Jack R. Benjamin and Theodore C. Zsutty on 2764.

2916. Discussion of Proceedings Paper 2332, 2500, 2502, 2615, 2616, 2690, 2728, 2731, 2736, 2801. (EM) O. C. Zienkiewicz on 2332. George Hermann and Anthony Armenakas on 2500. Ladislav B. Kriz and Seng-Lip Lee on 2502. Morris Ojalvo on 2615. P. Gondikas and Mario G. Salvadori on 2616. G. C. Reynolds on 2690. Shan S. Kuo on 2728. A. A. Eremin on 2731. Stanley Morse on 2736. Le-Wu Lu on 2801.

2917. Discussion of Proceedings Paper 2368, 2564, 2623, 2681, 2746, 2791, 2793, 2794, 2795. (SM) W. Heukelom and C. R. Foster on 2368. F. E. Richart, Jr. on 2564. Harry R. Cedergren on 2623. Stafford C. Happ on 2681. William Daniel Finn, B. V. Ranganatham, and I. da Silveira on 2746. Judson P. Elston on 2791. I. Alpan and Judson P. Elston on 2793. Judson P. Elston on 2794. Judson P. Elston on 2795.

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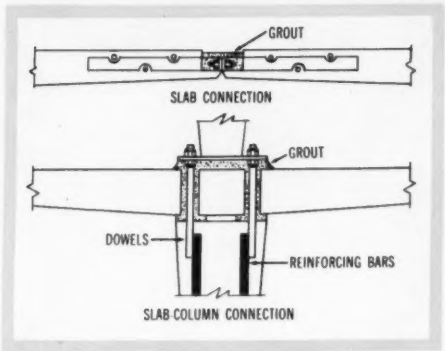

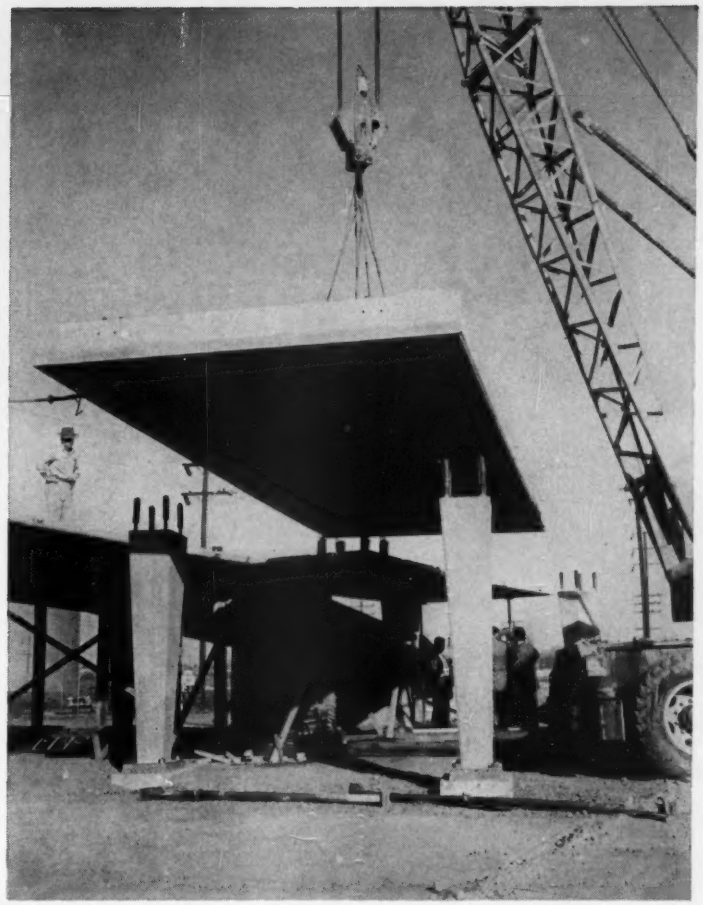

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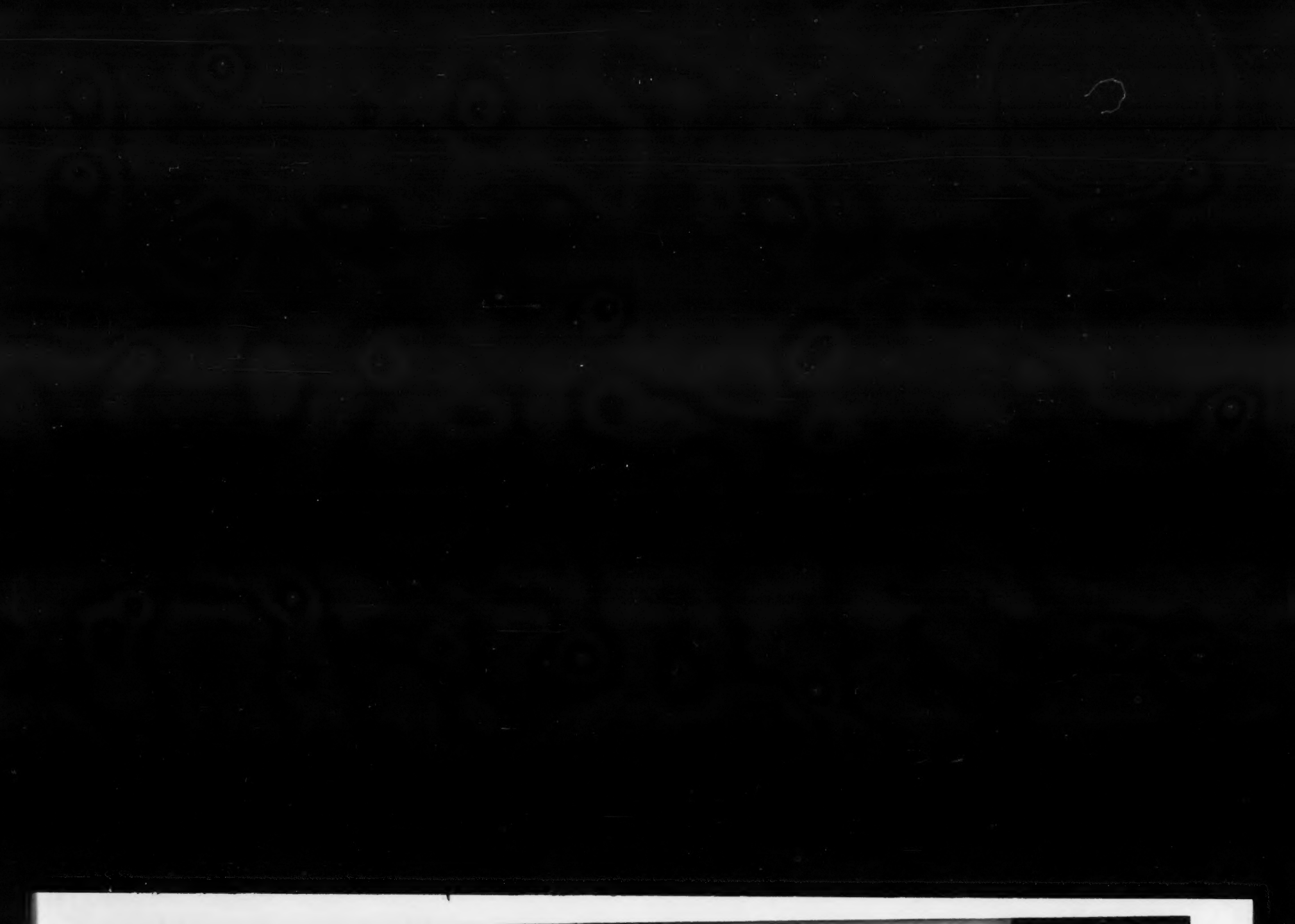
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